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THE DIVERSIFICATION OF AGRICULTURAL PRODUCTION IN LESS DEVELOPED NATIONS

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FOREWORD

The purpose of this bulletin is to provide an introduction to some of the major issues involved in national and regional diversification programs in the less developed nations. The focus is on diversification within agriculture (not diversification from agriculture).

The bulletin provides more questions than answers. In part this is a reflection of the present state of knowledge about diversification: although there are numerous references to the subject, little direct and rigorous research has been done. Furthermore, discussion of diversification is handicapped by its very nature: its diversity.

But hopefully this paper will raise the questions and issues which will both provide initial guidance to administrators and stimulate needed further study and research. It is a first step.

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THE DIVERSIFICATION OF AGRICULTURAL PRODUCTION IN LESS DEVELOPED NATIONS

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I. INTRODUCTION

The diversification of national or regional agricultural production promises to play an increasingly important role in the economic development of many less developed countries. The reasons for this are complex but center about changes in the supply and demand for agricultural products.

Yet diversification is more a subject of vague reference than actual knowledge. Little comprehensive general information is currently available for administrative or planning use. This report is an attempt to help correct that situation.

A. Framework of Analysis

1. Major Areas of Diversification

A primary characteristic of the economies of most less developed nations is their heavy dependence on the production of a small handful of agricultural crops. While many commodities may be grown overall -- and some may be quite important in certain regions -- the agricultural economy is usually largely based on the production of a few key products. In its most pronounced form, where only one to two major crops are involved, this may be referred to as monoculture.

In development literature, diversification is generally associated with a movement away from the monoculture of primary export crops, especially ones in world surplus such as coffee, tea, cocoa, and rubber. Monoculture is, however, not limited to these export crops; there are many others -- bananas, sugar, fibers, oils -- which may be of economic importance in certain areas. But in general they share the problems of their better-known brethren: an unfavorable or unpromising export supply and demand situation. Diversification -- the growing of new and/or additional crops -- is viewed as a way out.

Diversification may increasingly be considered for more temperate crops which are both exported and used domestically. In recent years the threat of food shortages has led to greatly increased emphasis on the production of basic food grains in less developed nations. This emphasis is beginning to result in increased output. Some nations are rapidly approaching self-sufficiency in grain, and a few even have surplus problems. It may not,

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* Staff Economist, Office of the Administrator, International Agricultural Development Service. Helpful comments on an earlier draft were provided by colleagues in the U. S. Department of Agriculture, several state universities, and other organizations.

therefore, be too soon for serious thinking about adjustments in grain production patterns.

Thus, the basis for discussion here is the diversification of production of both domestic and export crops.

2. General Structure of Agriculture

Agricultural production in the developing nations can, for our purposes, be roughly divided into two main categories: (1) subsistence or non-market (or non-monetary) production, and (2) market or commercial production.1/ Subsistence agriculture -- though it may represent more than half of total production -- has little direct influence on changes in the national economy.2/ In the context of economic growth, therefore, we will concentrate on the market economy. It is this sector, moreover, which is most likely to approach the conditions of a modern agriculture.

Market production itself may be of two main types: food and non-food. Food items are defined here as edible products of nutritional value. Non-food items include (1) edible tropical beverage products of no nutritional value such as coffee and tea, and (2) inedible products such as tobacco, inedible oilseeds, cotton and other textiles, and rubber. In 1965, non-foods accounted for 15 to 17% of total agricultural production in the less developed world.3/

The type of production unit varies somewhat depending on whether the marketed crops are to be used domestically or exported. Domestic crops are perhaps more apt to be grown on freeholder farms than is the case with export production. Export crops are more likely to be raised on plantations. But there are so many exceptions that it is hazardous to try to generalize.

3. Diversification and Agricultural Structure

Diversification can be approached on two levels: (1) diversification of the agricultural economy at the national or regional level or (2) diversification of individual farm operations. In many cases, the problem would

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1/ The line between the two is often hard to draw in practice. Moreover, individual farmers may engage in both types of production. The lack of homogeneity among subsistence farmers is reviewed by Marvin P. Miracle in "'Subsistence Agriculture' Analytical Problems and Alternative Concepts," American Journal of Agricultural Economics, May 1968, pp. 292-310.

2/ For a detailed discussion of this point, see K. C. Abercrombie, "Subsistence Production and Economic Development," Monthly Bulletin of Agricultural Economics and Statistics, May 1965, pp. 1-8.

3/ Dana G. Dalrymple, "The Relation of Food Production to Total Agricultural Output in the Less Developed Nations," U.S. Department of Agriculture, International Agricultural Development Service, August 1967, p. 2; The State of Food and Agriculture, 1965, FAO, Rome, p. 22.

be the same at both levels: the economies of both countries (or regions) and of individual farm operations may be heavily dependent on one crop.4/ In other cases, the problem may be more evident at the national or regional than at the individual farm level.5/ In yet other cases, the problem may be apparent at the individual farm level but not at the national level.6/ The primary focus of this report will be on problems of monoculture which are evident at the national level.7/

In the minds of some, diversification may be conceptually associated with a shift from a technically advanced monoculture to a more rudimentary and diverse form of self-sufficient agriculture. This is not necessarily correct, and in any case is not the kind of diversification envisaged here. What is conceived is the careful selection and adoption of a few additional types of market-oriented crops to be produced under modern agricultural practices at the national or regional level. A diversification program of this nature would be quite consistent with specialization of agricultural production at the farm level.8/ It might involve: no change on some farm operations, an additional crop or two on others, or a switch in cropping patterns on still others.

4/ Colombia is an example: 73% of the nation's foreign exchange income is provided by coffee, 60% of the agricultural output of the Department (State) of Caldas is obtained from coffee; and for many farmers in Caldas, coffee is virtually the only source of income (G. V. Samper, "The Promotion of Development and Crop Diversification in Predominantly Coffee Growing Areas," in Case Studies to Accompany 'Getting Agriculture Moving' (ed. by R. E. Borton), Agricultural Development Council, 1967, pp. 105-116).

5/ For instance, a review of Ethiopia's export-import situation suggests an urgent need for diversification, while a general view of individual farm operations would not lead to the same conclusion (letter from R. E. Borton, Stanford Research Institute, Agro-Industrial Survey, Addis Ababa, June 28, 1968).

6/ Because, for example, the farmers of the Barpali area of Orissa, India experienced income and nutritional difficulties due to their almost complete dependence on rice in the early 1950's (T. M. Fraser, "Introduction of Vegetable Growing," in Borton, op. cit., pp. 12-23), does not necessarily mean that a comparable situation existed at the State/Federal level.

7/ In other words, the diversification of individual farm operations is not our point of departure except as reflected in regional or national programs aimed at diversification out of monoculture.

8/ McLoughlin notes that as a result of lack of specialization in Africa "... a great deal of the best agricultural land which should be devoted to the production of high-value export crops is taken up with the growing of low-yielding grains and other food crops which could very well be raised as cash crops in other more environmentally suitable zones" (Peter F. M. McLoughlin, "Studying African Agriculture," Finance and Development, March 1968, p. 16).

Diversification may mean a shift from export crops to food crops for domestic consumption -- leading, in some cases, to import substitution and/or greater national self-sufficiency. In other cases, the process may mean a shifting of export crops. Or both steps may be involved.

B. Status of Diversification

The place of diversification can be quickly outlined in terms of the present situation and the outlook for the future.

1. Present Situation

Although much lip service has been given to agricultural diversification in various less developed nations around the world, on the whole, little has been accomplished.9/ The Asian Agricultural Survey suggests that this is due in part to "... lack of support from higher echelons of government where immediate concern is centered on the problems of expanding cereal production."10/

Still, some progress has been made. Following visits to six Latin American countries in 1966, Reuss reported that in each case, "... serious efforts were underway, both in planning and action, to achieve agricultural diversification of those crops in world surplus."11/ In Colombia, some coffee farms have been converted to "profitable" egg and poultry production.12/ Substantial progress has reportedly been made in coffee diversification in Brazil.13/ Thailand diversified its agriculture some years ago.14/ Taiwan and Korea have strong programs to expand vegetable and fruit production.15/ Except for the latter two nations, however, other Asian countries are "... doing relatively little to encourage the growth of

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9/ Vernon D. Wickizer, "International Collaboration in the World Coffee Market," Food Research Institute Studies, 1964 (Vol. IV, No. 3), p. 287.

10/ Op. cit., Vol. I, p. 72.

11/ Henry S. Reuss, Food for Progress in Latin America, House of Representatives, Committee on Banking and Currency, Subcommittee on International Finance, February 8, 1967, p. 12.

12/ Ibid. Details of the pilot program in the Department of Caldas are provided in Samper, loc. cit.

13/ "London Bun Fight," The Economist, August 26, 1967, p. 749; Jorge de sa Almeida, "The Coffee Question" (letter to the editor), The Wall Street Journal, July 23, 1968, p. 14.

14/ Lester R. Brown, Agricultural Diversification and Economic Development in Thailand: A Case Study. U. S. Department of Agriculture, Foreign Agricultural Economic Report No. 8, March 1963, 34 pp.

15/ Asian Agricultural Survey, Asian Development Bank, Manilá, March 1968, Vol. I., p. 7.

domestic supplies of income superior foods to meet the anticipated change in the composition of demand."16/

The general challenge has been well stated by FAO:

> For developing countries, the most urgent need is to intensify investment in those products with the brightest prospects, whether for export or domestic consumption, including foodstuffs now being imported in increasing quantities from industrialized countries.17/

Selection of the products with the "brightest prospects" can be, of course, a most difficult matter.

2. New Opportunities

The diversification of agricultural production is becoming increasingly possible from a technical viewpoint. In fact, there is reason for thinking that an agricultural revolution may be taking place in portions of Asia.18/ This is due to the availability of new inputs (such as fertilizer and new high-yielding seed varieties), changing price relationships, and a change in attitude on the part of farmer and government.

Johnson of the Ford Foundation describes the situation in India in these terms:

> New opportunities for intensifying agricultural programs through multiple cropping are presenting themselves...
>
> Indian farmers are prepared to innovate and change; Indian leaders... are beginning to understand the new potentials.
>
> ... Intensive agriculture... is now India's food production strategy; a program committed to multiple cropping is part of intensive agricultural development program.19/

16/ Ibid., p. 114.

17/ FAO Commodity Review, 1967, Rome, p. 2.

18/ Lester R. Brown, "The Agricultural Revolution in Asia," Foreign Affairs, July 1968, pp. 688-698.

19/ A. A. Johnson, "The Ford Foundation's Involvement in Intensive Agricultural Development in India - With Emphasis on Multiple Cropping," presented at Symposium on Cropping Patterns, Indian Council of Agricultural Research, New Delhi, January 28, 1968, pp. 1, 5.

The "Revolution" in Asia, to be sure, is pretty well confined to grains and is not present to the same degree in all countries. Nor has it become very apparent in Africa or Latin America as yet. But it is a harbinger of production changes that may take place in other countries in the future.

As, or where, grain supplies and incomes grow, diversification will become of increasing importance. This is well illustrated by a recent report from Afghanistan:

> In the next 18 months the principal challenge is to nail down self-sufficiency in major grains. After that farmers and investors will be turning more of their time and energy to cash crops, especially grapes, melons, and pomegranates with an eye to nearby export markets.[20]

A study of the potential for diversification from rice production in East Pakistan was recently completed.[21]

The opportunities for traditional export crops are less clear--more because of marketing than production problems. Still, attainment of basic food supplies will provide greater opportunity to expand production of other commodities for domestic use or export. With a system set up to provide inputs to basic food production and, with farmers more attuned to change, it should be considerably easier to introduce diversification in the future than ever before.

20/ "Economic Trends and Their Implications for the United States," American Embassy, Kabul, June 26, 1968 (annual), p. 9.

21/ Daniel G. Ritchie, "Diversification of Agriculture in East Pakistan," Agriculture Division, U.S. AID Mission, Dacca, East Pakistan, February 1968, 39 pp.

II. INTERRELATIONSHIPS OF MONOCULTURE & DIVERSIFICATION

Monoculture and diversification form part of a continuum. There is no generally accepted dividing line indicating when monoculture has been left and diversified agriculture attained. In fact, there may be a good deal of overlap. We shall look at the interrelationships first in terms of production and then marketing.

A. Production Interrelationships

Three aspects of production which are of special interest are (1) types of crops, (2) types of production unit, and (3) regional variability.

1. Types of Crops

Despite definitional problems, monoculture and diversification can be characterized to some extent.

a. Monoculture

Monoculture is generally thought of in terms of tropical export crops, but may also include crops for both domestic use and export.

(1) Export Crops

Traditional export crops tend to be perennials; they grow on shrubs and trees. Leading food items include such tropical products as cocoa and bananas. Edible nonfoods are coffee and tea. Inedible nonfoods include rubber and fiber crops (not all of which are perennials) such as jute, abaca, sisal, henequen, and coconut fiber (coir).

In many countries, export crops are of great importance to the national economy. In El Salvador, coffee accounts for about 50% of the foreign exchange earnings, 33% of agricultural income, and 10% of gross national product.1/ In Mainland Malaysia, rubber trees occupy two thirds of the cultivated land and provide the livelihood of 60% of the economically active population.2/ Banana exports provided the following proportions of national export earnings in recent years: Ecuador 60%, Panama 54%, Honduras 43%, Martinique 45%, Guadeloupe 34%, and Costa Rica 26%.3/

(2) Domestic and Export Crops

In some cases, monoculture can be found among crops which are less traditionally thought of as export crops. They are more likely to be annuals

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1/ Richard S. Welton, "El Salvador Plans Crops Diversification to Spur its Economy," Foreign Agriculture, August 7, 1967, p. 5.

2/ Goodloe Barry, "Rubber Sales Finance Malaysia's Imports," Foreign Agriculture, May 13, 1968, p. 5.

3/ G. L. F. Beckford, "Long-Term Fluctuations in Banana Exports: Further Evidence of Secular Fluctuations in Tropical Agricultural Trade," Economic Development and Cultural Change, April 1967, p. 323 (fn. 3).

and include such tropical/temperate food crops as rice, wheat, and sugar, and nonfood crops such as cotton.

The extent to which monoculture of these crops is carried out varies widely, except in the case of rice in eastern Asia. Of all the cultivated area in 13 Asian nations in 1965, rice was annually grown on more than 1/4 (28.1%) of the area. Up to the present none of the other major crops has more than sub-regional importance. The result is: "... a widespread crop pattern dominated by the continuous rice monoculture ... with the resultant neglect of agricultural diversification and of a more balanced development of small-farm crops."4/

b. Diversification

The kinds of crops considered for diversification programs vary from nation to nation, but generally tend to include horticultural crops, and animals and animal products. In addition, other crops are considered in specific instances. In Thailand, rubber, corn, cassava, sugar, and kenaf have been utilized to diversify from rice.5/ In some cases the crops are selected for domestic use; in others for export or import-replacing potential.

Diversification can be carried out in several broad ways: output of various commodities can expand at an uneven rate, or some commodities may expand while others contract. Similarly, the process may involve additions in the stock of resources, more intensive use of resources, or shifts in the use of resources.6/ In terms of agricultural operations, the following methods are often utilized:7/

- Changes in the pattern of year-to-year crop rotations, where they exist.

- Moving to multiple cropping. Multiple cropping is a sequence of different crops grown on the same land during a given period of time, generally a year.

- Shifts in present type of cropping pattern. This could take the form of (i) substituting one crop for another, or (ii) moving to mixed farming involving crop and livestock production.

4/ Chih Chen, "Production of Farm Crops," Asian Agricultural Survey, Asian Development Bank, Manila, March 1968, Vol. II, pp. 95, 103.

5/ Brown, op. cit. (1963), pp. 3-11.

6/ Ibid., pp. 3, 20.

7/ Developed from Johnson (A. A.), op. cit., pp. 1, 5.

In the context of this paper, the second and third forms are the most relevant.8/

2. Types of Production Unit

Monoculture is likely to be found on plantations or larger farms while smaller farms are more apt to be diversified. Or to put it another way, the larger farms are more prone to specialization than the smaller ones. Similarly, the production of export crops tends to be found on larger units while domestic food crops are more likely to be produced on smaller farms.9/ Myint has noted that "Important peasant exports are confined to a few countries of Asia and Africa... Latin America has little or no peasant exports."10/

The situation with respect to specific tropical export crops has been well summarized by Wickizer. He indicated that as of the late 1950's plantations generally held a definite competitive lead in the production of tea and sisal, and had an edge in cane sugar, bananas, and to a lesser extent, coffee. The freeholder often held the edge in cocoa and, where quality is not important, in oil-palm products. The situation was variable in rubber and coconut production.11/ The division is in many cases strongly influenced by marketing considerations -- of which we shall have more to say in a subsequent section.

A practice which is increasing in importance is referred to by Wickizer as "satellite" production. Production is largely in the hands of freeholders while technical supervision, processing, and marketing is handled by a large scale enterprise. He places sugar cane, bananas, and to a lesser extent, coffee, in this category.12/ According to Miracle, this

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8/ This classification is admittedly broader than the usual economic conception of diversification (and includes supplementary as well as competing crops). But a wider view is needed at the national or regional level.

9/ In Kenya, for instance, small farms produce most of the beans and potatoes, as much as 95% of the corn, and about all of the bananas (not an export crop). (Vance Q. Alvis, Marketing Selected Staple Foodstuffs in Kenya, West Virginia University, Department of Agricultural Economics and Office of International Programs, IP-25, March 1968, p. 284.)

10/ Hyla Myint, The Economics of the Developing Countries, Praeger, 1964, p. 38 (fn. 1).

11/ V. D. Wickizer, "The Smallholder in Tropical Export Crop Production," Food Research Institute Studies, February 1960 (Vol. 1, No. 1), pp. 52-53, 63. Also see: P. P. Courtenay, Plantation Agriculture, Praeger, 1965, pp. 57-59, 142; and B. Natapermadi, "Plantation Crop Planting Industry in the ADB Region," Asian Agricultural Survey, op. cit., pp. 185-294.

12/ Wickizer, op. cit. (1960), pp. 68-76, 87.

system is used for pineapples and tobacco in the Ivory Coast, palm oil in Cameroun, sugar cane in parts of Mexico and sugar beets in Chile;13/ it is also becoming increasingly important for bananas in Latin America.14/

3. Regional Variability in Production

Variations in types of crops and production units can lead to wide regional variations in the relationship between monoculture and diversification. A given crop may be produced under conditions approaching monoculture in one country or region, but on a considerably less intensive basis elsewhere. Rubber and sugar, for instance, may represent monoculture in some areas, but were part of Thailand's diversification program.15/

The basis for specificity of production is in part due to biological adaptability. Certain crops simply are best suited to production in certain areas -- whether this be due to combinations of soils, weather, insect and disease problems, etc. The result may be that a given crop or set of crops may have, or once have had, a comparative advantage and is hence emphasized. But this is not to say that the pattern is optimal for the present or for the future. Technical, economic, social and other changes may bring about a need for new patterns and adjustments.

The adjustments may not distort present patterns greatly -- but rather augment them. Grain production in Asia is a case in point. New varieties of rice and wheat have shorter growing seasons than older varieties; where water and other inputs are available it is increasingly possible to double and triple crops.16/ The second and particularly the third crops need not necessarily be food grain once basic needs are met.17/

In Africa, Johnston indicates that a good deal of qualitative evidence

> ... seems to indicate that it has usually been possible to superimpose production of an export

13/ Miracle, op. cit. (1960), p. 293 (fn. 1).

14/ R. A. Smith and Richard Ogden, "Bananas in Colombia," Foreign Agriculture, December 11, 1967, pp. 8-9; W. G. C. Forsyth, Farming Systems: Plantations or Small Landholders," in Rural Development in Tropical Latin America (ed. by K. L. Turk and L. V. Crowder), New York State College of Agriculture, Cornell University, 1967, pp. 126-129.

15/ Brown, op. cit. (1963), pp. 8, 11.

16/ "Intensification of Plant Production," The World Food Problem, The White House, Vol. II, May 1967, p. 233.

17/ Grain sorghums for livestock feed may be an important possibility in some Asian nations. There is considerable interest in East Pakistan in expanding the production of potatoes on rice land during the winter or Boro season (Dana G. Dalrymple and Robert V. Akeley, The Potato Industry in East Pakistan: Improving Seed Potato Production and Storage, U.S. Department of Agriculture, International Agricultural Development Service, May 1968, pp. 10, 11).

> crop or crops on the traditional agriculture without affecting food crop production adversely.[18]

This is made possible by non-competing seasonal demands for labor, and other inputs. The result is a net addition to farm output and income.[19] These situations are not the rule, but do suggest that diversification can sometimes be closely related to present monoculture production patterns in certain regions.

B. Marketing Interrelationships

In terms of interrelationships between monoculture and diversification three marketing elements are of special interest: (1) the relation between domestic consumption and export, (2) the nature of demand, and (3) the influence of processing.

1. Domestic Consumption and Exports

Although there are many crops which are not exported, there are few export crops which are not consumed or used domestically to some degree. The proportions vary widely, but domestic use would tend to be lower for non-foods -- such as rubber among the inedibles and coffee and tea among the edibles -- and higher for foods. It is hazardous to try to make an arbitrary division on the basis of production unit, for some plantation crops like sugar may be used largely, or wholly, for domestic purposes.[20]

While it is difficult to develop reliable figures, it might be of interest to make a rough comparison of production figures with export data as reported for several leading commodities -- recognizing that the domestic residual represents loss to spoilage, shrinkage, etc. FAO data for 1965 show the following regional relationships:[21]

18/ Bruce F. Johnston, "Changes in Agricultural Productivity," in Economic Transition in Africa (ed. by M. J. Herskovits and M. Harwitz), Northwestern University Press, 1964, p. 153. Also see Myint, op. cit., pp. 40-45. A reciprocal possibility has been suggested in Malaya: intercropping rubber plantings with food crops ("Focus on Agricultural Diversification," The Malayan Agriculturist, 1964/65 (Vol. 5), pp. 3-5).

19/ A curious aspect is that the production of export crops on many such farms is more advanced in terms of technology and management than is the production of food crops; while they may be raised side by side there has been almost no rub-off effect between the two (McLoughlin, op. cit., p. 16).

20/ This is, for example, the case in Kenya (L. H. Brown, "Agricultural Change in Kenya: 1945-1960," Food Research Institute Studies, 1968 (Vol. VIII, No. 1), p. 67).

21/ Computed from data in FAO 1966 Production and Trade Yearbooks.

Region	Proportion of Production Exported		
	Bananas	Coffee	Tea
Central America	47%	79%	NA
South America	16	50	93%
Asia	6	80	61
Africa	41	71	91

The proportions exported in many individual countries are considerably higher. For bananas they were as follows in 1965: Costa Rica 56%, Guatemala 57%, Honduras 67%, Nicaragua 73%, Ivory Coast 93%. Over half the palm oil produced in the leading exporting nations is consumed domestically.22/

The proportions exported would, of course, be lower for food crops such as grain or livestock. In some cases, exports may actually represent a residual above domestic demand.

2. Nature of Demand

Consumption patterns for agricultural -- as well as other -- products are closely related to the elasticity of demand. We shall focus on the influence of income.23/ As incomes go up, consumers spend relatively more on some items than others. Those purchased in increasing quantity per capita have a higher income elasticity of demand.

Estimates of income elasticities for major food products in the less developed nations are summarized in Table 1.24/ It will be noted that the elasticities are: (1) lowest for starchy roots, cereals, and pulses and nuts; (2) highest for milk, eggs, sugar, and fats and oils; and (3) intermediate for fruits and vegetables, tropical beverages and meats. While the situation might vary widely in individual nations and between rural and urban areas, one might expect a general increase for the items with higher elasticity as incomes improve.

22/ David L. MacFarlane and Martin A. Oworen, Investment in Oil Palm Plantations in Nigeria, University of Nigeria, Economic Development Institute, August 1965, p. ix.

23/ According to FAO projections, income will account for 16 to 32% of the increased demand in developing nations during the period from 1965 to 1975; the proportion in the developed nations will range from 29 to 39%. The rest of the growth will be provided by population increase. (Agricultural Commodities - Projections for 1975 and 1985, FAO, Rome, 1967, Vol. I, p. 14.)

24/ These data refer to the quantity purchased, not the amount of total expenditure (an elasticity based on the latter would be higher). They reflect internal demand only; in no case do they relate to the demand for export (letter from M. de Nigris, Commodities Division, FAO, Rome, July 3, 1968).

Table 1. ESTIMATED INCOME ELASTICITIES OF DEMAND FOR AGRICULTURAL PRODUCTS IN LESS DEVELOPED NATIONS*

Commodity Group	Income Elasticity**
Starchy roots 1/	0.12
Cereals 2/	0.33
Pulses and nuts 3/	0.35
Vegetables 4/	0.43
Fruit 5/	0.51
Meat 6/	0.61
Fats and oils 7/	0.70
Sugar 8/	0.70
Eggs	0.85
Milk	1.01
Tropical beverages 9/	0.47 - 0.65

Notes:

* Excluding Communist nations.

** Quantity elasticity.

1/ Potatoes, sweet potatoes, yams, cassava, etc.

2/ Cereals and cereal products. Estimates for specific cereals are: wheat 0.42, rice 0.36, coarse grains 0.22.

3/ Beans, peas, lentils, chickpeas, soybeans, groundnuts (peanuts). Excludes oil production.

4/ Excluding commodities included in starchy root category. Fresh equivalent basis. Very incomplete data on home production.

5/ Fresh equivalent basis. Estimates for specific fruits are: citrus 0.78, bananas 0.23, others 0.65.

6/ Estimates for specific types of meat are: beef and veal 0.55, mutton and lamb 0.72, pork 0.63, poultry 0.80, others 0.54.

7/ Estimates for specific types of fats and oils are: vegetable oils 0.72, butter 0.77, others 0.61.

8/ Cane and beet sugar.

9/ Coffee 0.47, cocoa 0.65, tea 0.62.

Source:

Agricultural Commodities - Projections for 1975 and 1985, FAO, Rome, 1967, Vol. II, pp. xviii - xxi, xxiv - xxv, 153 (Zone C) (Data for individual countries are summarized in Table I.8, pp. 28-33).

Where do specific export crops rank? Among the tropical products, bananas are perhaps the lowest in elasticity (0.23), coffee is higher (0.47), tea next (0.62), and cocoa highest (0.65). Among the tropical/temperate crops, rice ranks lowest (0.36), while fats and oils and sugar rank quite high (0.70).

Diversification might involve any of the commodities listed in Table 1.[25] Still, those crops generally associated with "monoculture" (except sugar) rank somewhere in the low to middle elasticity range, while those more commonly associated with a diversification program -- horticultural crops, animal and animal products -- rank in the middle to high ranges. Those with a higher elasticity will be in a relatively stronger position as domestic incomes rise.

3. Role of Processing

Monoculture and diversification can be strongly shaped by processing.

a. Nature and Importance of Processing

A large portion of agricultural production undergoes some degree of change between harvesting and final use. In the early stages of development, processing is oriented to the preparation of staple goods (e.g. the milling of wheat and rice) which provide the basis of the diets of low income consumers. As incomes rise, there is a shift toward more elaborate processing of more expensive foods -- the products of a more diversified agriculture -- such as those noted in the previous section.[26]

Processing of agricultural products in one form or another plays an important role in the economies of the less developed nations. It accounts for a large share of the value added by manufacturing (51% in 1958) and of total industrial development (64% in 1958). Food, beverage and tobacco industries are particularly important in some Latin American countries while textiles are most important in the Far East, particularly in Pakistan and India.[27] Processing can also be important in terms of foreign exchange earnings. As FAO has put it:

> When a product formerly exported in raw form is processed before export, or when a processed commodity previously imported is produced local-

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25/ As noted earlier (fn. 17), potatoes are an initial element in diversification in East Pakistan.

26/ "Agriculture and Industrialization," The State of Food and Agriculture, 1966, FAO, Rome, 1966, pp. 79, 88, 89.

27/ Ibid., pp. 87-89.

> ly, a country can obtain for itself the value added that formerly accrued elsewhere.28/

Processing, moreover, can have an important influence on production and marketing patterns. The preceding FAO report indicates that often the establishment of processing facilities is itself an essential first step in the stimulation both of consumer demand for the processed product and of an adequate supply of raw material.29/ In turn, the success or failure of the processing facility is strongly conditioned by problems of raw material supply and of market demand.30/

b. Influence on Type of Agriculture

The influence of processing depends somewhat on the market. Products which are exported may require more preparation and processing than those which are marketed locally. These requirements will in turn influence the type of agriculture involved.

Certain export crops -- such as tea, cane sugar, coffee, and sometimes rubber and oil -- require considerable processing. Techniques used by small producers have often been crude and inefficient. Plantations provide a large scale vertically-integrated organization which is well suited to complex processing and marketing.31/ Kilby recently put it this way with respect to Nigerian palm oil:

> ... processing in large plantation mills gives a greater extraction efficiency, a better quality oil, and -- owing to planned full-capacity operation -- lower processing costs than are obtainable under a peasant small-holder system.32/

28/ Ibid., p. 92. Not all the value added, however, amounts to a net gain in foreign exchange because of the need to import machinery, etc.

29/ Ibid., p. 85.

30/ For detail see H. J. Mittendorf, "Marketing Aspects in Planning Agricultural Processing Enterprises in Developing Countries," Monthly Bulletin of Agricultural Economics and Statistics, April 1968, pp. 1-8.

31/ Ibid., p. 81; Wickizer, op. cit. (1960), pp. 63-72, 76-89; Courtenay, op. cit., p. 142; and C. Davis Fogg, "Economic and Social Factors Affecting the Development of Small-holder Agriculture in Eastern Nigeria," Economic Development and Cultural Change, April 1965, pp. 278-279, 287.

32/ Peter Kilby, "The Nigerian Palm Oil Industry," Food Research Institute Studies, 1967 (Vol. VII, No. 2), pp. 177-178.

Wickizer notes that while the production of certain crops such as oil palms and coffee may be relatively easy, preparation for the market or marketing itself is more difficult. In the case of other crops such as tea and cane sugar, both steps are considerably more complicated -- which means that a more substantial investment is involved.33/ Wickizer adds that when the processing phase of production is especially expensive or difficult, "the plantation is usually obliged to engage heavily in production in order to have assured regular supplies for economical factory operation."34/

So it would seem that there are certain economies to linking the processing and marketing of some export crops to plantation agriculture, to monoculture. To the extent this is so, there might be restraints on introducing these crops for diversification purposes. And where heavy investments have been made in processing one crop, it would be difficult -- and perhaps unwise -- to shift to additional crops.

On the other hand, processing requirements for some export crops, notably cocoa and copra, are less demanding and as a result plantations may not have any special advantage over freeholders.35/ The differential can be reduced even further when attention shifts to domestic food crops such as grain -- for which milling facilities are to be found in relative abundance in the developing nations. Furthermore, new techniques are making some small-scale processing operations increasingly feasible.36/

Foreign firms are more and more investing in various forms of processing operations in less developed nations. American firms are involved in a wide range of products.37/ American processors are sensitive to charges

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33/ Wickizer, op. cit. (1960), pp. 63, 95. Also Eric S. Clayton, "Small Scale Cash Crop Production in a Developing Economy," Economic Development and Cultural Change, July 1961, p. 623.

34/ Wickizer, op. cit. (1960), p. 95.

35/ Ibid., p. 63.

36/ "Agriculture and Industrialization," op. cit., pp. 83, 96.

37/ Although American firms have been operating overseas since the turn of the century - Heinz established a small cannery in London in 1902 -- it was not until the 1960's that the volume of investment in fruit and vegetable processing operations in the less developed nations began to amount to much (Dana G. Dalrymple, "Foreign Fruit and Vegetable Processing Operations of U.S. Firms," U.S. Department of Agriculture, Federal Extension Service, May 1966, 18 pp.). American firms have also provided assistance for processing ventures in less developed nations for some time and were, for example, quite active in the Soviet Union in the late 1920's (Dana G. Dalrymple, "American Technology and Soviet Agricultural Development, 1924-1933," Agricultural History, July 1966, pp. 200-201).

of neo-colonialism and generally do not own farms or plantations but obtain products from freeholders. This, to be sure, involves certain supply problems but they are increasingly being met by contractual methods. The products processed are often sold within the nation, but where markets have not yet developed -- such as for canned or frozen fruits -- they are exported. The growing presence of such firms may offer a substantial opportunity for moving away from traditional monoculture.38/

38/ "Agriculture and Industrialization," op. cit., p. 101; J. R. Moore and F. A. Padovano, U. S. Investment in Latin American Food Processing, Praeger (Special Study Series), 1967, 208 pp. Also the following articles in the Harvard Business Review: Simon Williams "Private Investment in World Agriculture," November/December 1965, pp. 95-105; George C. Lodge "Food Processing - Key to Economic Development," September/October, 1966, p. 6 ff; Ray A. Goldberg, "Agribusiness for Developing Countries," September/October 1966, pp. 81-93.

III. REASONS FOR DIVERSIFYING FROM MONOCULTURE

Why should a nation want to diversify from monoculture? The reasons center around both disadvantages of monoculture and the advantages of diversification.

A. Disadvantages of Monoculture

We shall first look at some of the general disadvantages of monoculture and then look at the special problems of export crops and of grain crops.

1. General Difficulties

The general problems may be said to fall into three categories: technical, economic, and political.

a. Technical

Producers under monoculture are vulnerable to changes induced by (1) insect and disease problems and (2) technological change. These can lead to displacement of the country or area by other more favorably situated or more progressive regions.

The hot humid climate of tropical areas presents an especially favorable environment for the multiplication of insects and diseases. The resultant damage to crops may either raise the cost of production or lower quality. This may lead to a displacement by other areas where there is natural immunity or where insect and disease controls are more highly developed.

Technological changes may give a major cost advantage to substitute commodities, such as the development of synthetic fibers which compete with wool or cotton. Mellor points out that often, however, the vulnerability is more the result of stagnation: "In a dynamic world, any country which specializes in one or a few commodities and continues a static production pattern is highly vulnerable to competition from a more dynamic producer."1/

b. Economic

Economic difficulties with monoculture stem both from (1) putting a lot of eggs in one basket and (2) the nature of the supply and demand relationships for the commodity.

The second point is of particular interest. On the supply side there is the matter of inelasticity of supply. Many monoculture crops, particularly those which are exported, are perennials (shrub and tree crops) and

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1/ John Mellor, The Economics of Agricultural Development, Cornell University Press, 1966, p. 108.

have a low elasticity of supply.2/ Short-term fluctuations in supply are caused mainly by weather and biological factors; these variations are particularly likely in less developed countries because of the paucity of control measures.3/ Thus, supply does not change readily to accommodate changes in demand, but is subject to short-term variations due to random events. If at the same time there is a relatively low price elasticity of demand for the product, the result can be -- and is -- sharp short-term price variations.

Over the longer run there is the question of trends in supply and demand. The effective demand (desire backed by money) for many monoculture crops, as we shall discuss later, does not appear likely to strengthen. While there will be potential demand from population growth, it may be of limited economic value because of a lack of purchasing power. At the same time, long-run trends suggest that the production of many monoculture crops may be on the increase. The result is not likely to lead to a strengthening of prices.

Thus, many monoculture crops face the depressing combination of sharp short-term price fluctuations together with an unpromising price situation in the long run.

c. Political

Many monoculture crops, as suggested in the previous section, have been grown on plantations or some variation thereof. Although strong economic arguments can be made for large-scale production of certain export crops, there are often pressing political and social arguments in opposition.

Plantations tend to be associated, rightly or wrongly, with both backwardness and colonialism. There is, as Mellor has noted, a desire on the part of developing nations "... to turn away from the vestiges of colonialism represented by plantation agriculture...."4/ At the same time there has been an increased interest in land reform -- in dividing up large farms among small landholders -- who are less likely to engage in monoculture.5/

2/ Courtenay, op. cit., pp. 96-97. An exception is provided by commercial fiber crops which have relatively high elasticities (Raj Krishna, "Agricultural Price Policy and Economic Development," in Agricultural Development and Economic Growth (ed. by H. M. Southworth and B. F. Johnston), Cornell University Press, 1967, p. 604).

3/ Alasdir I. Macbean, Export Instability and Economic Development, Harvard University Press, 1966, p. 25.

4/ Mellor, op. cit., p. 109.

5/ See, for example, Ronald J. Clark. "Land Reform and Peasant Market Participation in the North Highland of Bolivia," Land Economics, May 1968, pp. 153-172.

The future of plantation monoculture in many regions is not promising.6/

2. Special Problems of Export Crops

The general problems of monoculture are particularly severe in the case of export crops.7/

a. Supply

Supply problems are related to biological difficulties and adjustment lags.

(1) Biological Difficulties

Examples of biological difficulties are not difficult to find. Over the course of history plant diseases alone have had a singular influence on banana, coffee, and tea production.8/

Due to the vicissitudes of weather and disease, leadership in banana exports has moved around the Western Hemisphere -- from Jamaica in 1934-1938, to Honduras in 1946-1951, and to Ecuador in 1952.9/ Disease further accounts for shifts within nations: in Colombia, Panama disease coupled with other problems in the traditional production area increased costs to the point where fruit could no longer compete on the export market; hence during the past five years a new banana-producing area was carved out of the northern jungles and has become the principle source for export.10/

There are more recent examples. A unique one is provided by Argentina which has had severe problems in marketing its beef in the United Kingdom -- a leading source of foreign exchange -- because of a possible tie with the destructive outbreak of hoof and mouth disease.11/ Nicaragua, the No. 1 cotton producer in Central America has been "... plagued by incessant crop damage from pests and drought."12/ As a result of this and increased production costs, the country has seen its economic growth rate fall back about half.

6/ See Courtenay, op. cit., pp. 122, 131, 134.

7/ In this section we refer to both traditional exports of tropical crops as well as tropical-temperate crops except food grains, which will be discussed in Section 3.

8/ For detail see G. L. Carefoot and E. R. Sprott, Famine on the Wind: Man's Battle Against Plant Disease, Rand McNally, 1967, pp. 110-167.

9/ Wickizer, op. cit. (1960), p. 72.

10/ Smith and Ogden, op. cit., p. 8.

11/ "Till the Cows Come Home," The Economist, May 11, 1968, pp. 67-70.

12/ Richard S. Welton, "Problems Halt Fantastic Growth in Nicaragua's Cotton Industry," Foreign Agriculture, February 12, 1968, pp. 2-4.

These examples are not necessarily typical, but they do indicate the nature and potential importance of biological problems for export crops.

(2) Adjustment Difficulties

Adjustment difficulties for export crops relate not only to the inelasticity of supply noted in the previous section but also to the question of balance with domestic food production.

The inelasticity of supply for perennial export crops is, of course, related to the amount of time it takes to bring them into commercial production. This period is usually in the neighborhood of four to seven years: for tea it is four years; for rubber, six to seven years.13/ By the time the plants come into production, a substantial investment has been made.

Annual crops, by definition, do not face this production lag and therefore adjustments can be made rather more quickly. In such a case, the elasticity of supply would more nearly depend on degree of commercialization of agriculture, type of landholding (freeholders are more flexible than plantations), alternative crops, availability of technical inputs, etc.14/

In either case, given limited resources, an expansion in monoculture for export purposes may result in a decrease in resources available for domestic food production. Tolley and Gwyer report that "Large-scale importation of food appears to have been an accompaniment of expanding cash export production in some countries such as Malaya, Indonesia, and Peru."15/

b. Demand

The products of a monoculture are both marketed domestically and exported. Domestic markets will grow slowly as incomes increase. Export markets may be divided into less developed and developed nations: while demand in other developing nations may grow as noted above, the situation in the developed countries is not promising. The basic problem is that the net import demand of high income countries will "... scarcely grow between 1961-63 and 1975."16/

13/ Courtenay, op. cit., p. 96; Fogg, op. cit., p. 281.

14/ Krishna, op. cit., pp. 504-505; George S. Tolley and George D. Gwyer, "International Trade in Agricultural Products in Relation to Economic Development," in Southworth and Johnston, op. cit., pp. 427-428; Courtenay, op. cit., pp. 124-125.

15/ Tolley and Gwyer, op. cit., p. 414.

16/ Agricultural Commodities - Projections for 1975 and 1985, FAO, Vol. I, 1967, p. 15.

The situation varies however, depending on the specific product and country. A widespread and dynamic growth in demand is expected for feed-grains and livestock products. Expansion in demand for sugar and oilseeds will be mixed. The outlook for tropical products is for slow growth in demand (levels of use are already high). Among raw materials, an increase in demand is likely for wool and rubber, while the trends for cotton, jute, and hard fibers are uncertain.17/

c. Prices

We have noted previously that monoculture crops are subject to sharp short-term fluctuations in prices and a generally discouraging trend in prices.

This is especially true for the export crops of less developed nations, particularly when terms of trade are considered.18/ An FAO review of the world price situation in 1966 stated that:

> The overall effect was not advantageous to the developing countries. The prices of many of their major exports... generally fell, while those of basic foodstuffs -- grains and rice -- and manufactured products, which account for much of their imports, were higher.19/

Short-term prospects for 1967 were a little better for some crops, worse for others. The longer-term outlook for 1975 is for: a strengthening in prices for meat; about the same situation in coarse grains, cocoa and wool (and possibly fats and oils); and for downward pressure on prices for sugar, bananas, tea, rubber, cotton and hard fibers (and possibly jute).20/

d. International Control Machinery

In order to stabilize -- and preferably increase -- prices of export crops on international markets, elaborate supply control machinery has been established. International agreements are in existence for wheat, coffee and olive oil, and were formerly operative for sugar and tea. Negotiations

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17/ FAO Commodity Review, 1967, pp. 24-25. Details are provided by commodity on pp. 30-174. Sugar is rather a special case because perhaps half of it is traded under preferential arrangements.

18/ Exceptions are provided by tea and bananas which have experienced a high degree of price stability (Tolley & Gwyer, op. cit., p. 427).

19/ FAO Commodity Review, 1967, p. 1.

20/ Ibid., p. 26.

on a cocoa agreement have been underway for some time. Discussions of methods of stabilizing trade have been conducted for cotton, jute, rice and oilseeds. The agreements are generally for a given period of years, and several are currently up for renewal.21/

The idea of using international agreements is intuitively appealing, and successes have been achieved. But the realities of operation indicate that the path is not an easy one. Most of the agreements were born in strife and have not had an easy time.22/ While the administrative cost of establishing and operating agreements is not known, it must be high. The operation of domestic farm programs is difficult; the problems are multiplied many times on an international level.

It has been felt that the programs are essential to stabilize international prices of export crops and to reduce unfavorable effects on economic development. A recent study by Macbean suggests that the adverse effects of instability may have been overestimated. If this is so, he notes that "... the possible benefits to underdeveloped countries of even the best possible schemes for stabilization may be very small." For this reason he suggests that possibly only the simplest and cheapest forms of policies should be considered. Macbean's analysis has not gone unquestioned.23/

21/ "Recent Action on Commodity Problems," FAO Commodity Review, 1967, pp. 191-193; "Recent Developments in the World Food and Agriculture Situation," Monthly Bulletin of Agricultural Economics and Statistics, November 1967, p. 6; and John A. Pincus, "Commodity Agreements: Bonanza or Illusions?" Columbia Journal of World Business, January/February 1967, pp. 41-50. Background is presented in: Gerda Blau, International Commodity Agreements and Policies, FAO Commodity Policy Studies 16, Special Studies Program No. 1, 1964, pp. 1-20; Robert L. Tontz (ed.), Foreign Agricultural Trade; Selected Readings, Iowa State University Press, 1966, pp. 349-417 ("Trade Stabilization: Commodity Agreements"); Courtenay, op. cit., pp. 96-120; and Jerome Jacobson, "Difficulties in Framing Effective Commodity Agreements," International Development, June 1968, pp. 10-15.

22/ The International Coffee Agreement of 1962, for instance, was signed after a long period of declining prices -- which had not been stemmed by various interim producers' agreements. Prices increased through 1964, then dropped through 1967, but have strengthened somewhat in 1968 (see source cited in fn. 28 /chart 20/ for detail). A new agreement has recently been negotiated and is now being ratified by member nations (see International Coffee Agreement, 1968, World Coffee Information Center, Washington, 38 pp.).

23/ Macbean, op. cit., p. 340. A critical review is presented by A. Maizels in The American Economic Review, June 1968, pp. 575-580.

It is not our purpose to pass judgement on international commodity agreements. It does seem clear, however, that they are both complex and controversial.

e. Contribution to Economic Development

It is difficult to accurately assess the role of export crops in domestic economic development. Certainly -- as we shall demonstrate later -- the crops provide a large share of the foreign exchange earnings of many less developed countries. But whether this means that they made a commensurate contribution to development is another matter.

The reason ties back to ownership. As we have noted, much of export production takes place on plantations or their equivalent. They are often under foreign ownership. Mellor notes:

> Favorable linkages may also be at a minimum in a foreign-dominated plantation industry which purchases most of its material from abroad, which uses unskilled labor except for a few imported technicians, and which exports both its products and a major part of its profits. Such an industry is essentially a foreign enclave which lacks favorable growth-stimulating linkage.24/

There are, of course, exceptions. Plantations have "... played an important role in augmenting Ceylonese national product" (but "...did little by way of improving the quality of the labor force").25/ Courtenay suggests that "Many of the less developed countries owe much of the development that has occurred to plantation enterprises."26/ Even so, the position of plantations is in a state of change in many nations. With increasing nationalism, foreign ownership of production may decrease or assume a new posture in the future. But there are many constraints, of a technical and economic nature, which will limit how far and how fast this process can continue.27/

In any case, a more general problem will be offered by the unfavorable trends in earnings from export crops which we have noted earlier. Accord-

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24/ Mellor, op. cit., p. 108.

25/ Youngil Lim, "Trade and Growth: The Case of Ceylon," Economic Development and Cultural Change, January 1968, pp. 249, 256.

26/ Courtenay, op. cit., p. 3. Also see p. 64.

27/ Ibid., pp. 4, 122-134. J. V. Levin, The Export Economies: Their Pattern of Development in Historical Perspective, Harvard University Press, pp. 1-24.

ing to data prepared by the World Bank, the value of four leading export commodities -- coffee, sugar, cotton, and rubber -- remained essentially static from 1950 to 1965. The situation is not likely to improve. This, of course, places a constraint on the contribution exports can make to development.28/

3. Special Problems of Food Grain Crops

Food grain crops, as compared with tropical export crops, are more apt to be produced by a relatively wide range of the agricultural community. In large part they are consumed domestically, though some may be exported. They may or may not represent monoculture, depending on the country and region. But where they do, they share some of the more general problems of monoculture crops noted in previous sections. Here we shall concentrate on problems brought about by supply-demand relationships.

a. Supply

Within the past few years there has been a great deal of concern with increasing national food grain supplies in the developing countries to at least minimal level. Severe food shortages threatened. The strong efforts which were applied are beginning to bear fruit. Grain supplies have reached or are approaching subsistence levels in several less developed countries. Mexico has had a surplus problem with wheat and corn for the last two years29/; Kenya has had a surplus of corn.30/ India, Pakistan and Turkey have recently harvested sharply increased grain crops.31/ While it may be a long time before aggregate production meets needs in the less developed world,32/ the tide may be turning in some countries.

At the same time, there is a surplus of grain in the developed world which appears likely to continue.33/ While on one hand this means that grain

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28/ Irving S. Friedman, The Developing Countries in the Past Twenty Years: Growth Transformation and Problems, World Bank, Washington, May 1968, Chart 19.

29/ John C. Scholl, "Mexico's Grain Problem: A Production Boom That Won't Turn Off," Foreign Agriculture, July 3, 1967, p. 7.

30/ Chester Wells, "Maize" (unpublished report on file in International Agricultural Development Service), November 20, 1967, p. 1.

31/ Brown, op. cit. (1968), p. 697. Improved weather played an important role.

32/ FAO projections, made before the effect of the new varieties was fully apparent, indicated that under one assumption the cereal deficit in the developing nations by 1975 would rise slightly above the 1961-63 level of 21.5 million tons; under a more pessimistic assumption the deficit might be twice as high (Agricultural Commodities, op. cit., p. iv, 17).

33/ Ibid.; M. E. Abel and A. S. Rojko, World Food Situation; Prospects For

will be available for concessional programs to developing nations, it also means that it will be available on -- and loading down -- the international commercial market. Thus less developed nations which do manage to increase output, may face severe competition in export markets.

b. Demand and Prices

Demand will largely be shaped by population and income. Expanding populations will provide a growing overall market for grain in the developing world for some period. But there may well be times and places when food grain supply exceeds demand. Furthermore, as incomes improve, customers will begin to seek other foods. The result may be, in some cases, a leveling off or weakening in the demand for food grains. This may, in turn, lead to absolute or relative food grain price declines (there is already concern with world rice prices and with wheat prices in the Indian subcontinent).34/

Spain faced such a problem in 1967 when it had a surplus production of food grains. Part of the problem was that "... agricultural production still largely reflects the eating habits of bygone days." Spanish consumers today are eating less bread and other starchy foods, and more of other products.35/ This situation could well be repeated in many developing nations.

The authors of the Asian Agricultural Survey indicate that as a result of trends in east Asia:

> Government action in the form of support prices for cereals will likely be necessary in many countries in the not too distant future if the incentive structure supporting the thrust toward modernization is not to be severely jeopardized. But there is a limit on how far government price supports can continue to encourage cereal production.36/

World Grain Production, Consumption, and Trade, U.S. Department of Agriculture, Foreign Agricultural Economic Report No. 35, September 1967, p. iii.

34/ Asian Agricultural Survey, op. cit., Vol. I, pp. 71, 114; James Keefer, "The World Rice Situation and Outlook," U.S. Department of Agriculture, Economic Research Service, working paper, June 1968, 10 pp.; H. R. Suri, "Problem of Plenty," Far Eastern Economic Review, June 27, 1968, p. 662; "Indian Govt. Food Policy Under Fire," Journal of Commerce, July 3, 1968.

35/ "Large Agricultural Outturn Leaves Spain With Surplus Problem," Foreign Agriculture, December 4, 1967, p. 12.

36/ Op. cit., Vol. I, p. 71.

In short, problems of scarcity of food grains in some less developed countries may be replaced by problems of abundance. This is progress, but still leaves the less developed nation with adjustment problems similar to those found in the more traditional monoculture export crops. One of the answers may be to consider using more of these grains for livestock feeding as part of a diversification effort.

B. Advantages of Diversification

The disadvantages of monoculture present a somewhat negative case for moving to a different organization of production such as diversification. A more positive case can be developed for diversification -- for it offers a number of distinct advantages over monoculture.

1. Supply

From a supply point of view, diversification offers certain direct potential advantages to both farmer and government.

a. Farm Level

Where diversification programs conducted at a national or regional level means diversification of individual farm operations, several benefits may result.37/ Assuming that the farm formerly practiced monoculture, diversification may take the form of multiple cropping or mixed farming. If the new enterprises are properly selected, the result could be a reduction of economic risk. Moreover, the new crops -- through production and marketing complementarities such as fuller utilization of labor -- could increase the efficiency of the overall farm operation.38/ The result could well be an increase in farm income (such, at least, has been the case with diversification programs conducted in Thailand, Colombia, and India).39/

At a recent meeting of the Indian Council of Agricultural Research it was concluded that:

> From the economic point of view for [1] profit maximization, [2] risk minimization and [3]

37/ Broad-scale programs do not, as we have pointed out earlier, necessarily mean that operations on each farm are diversified in terms of adding more crops. They may just lead to a switch in cropping patterns. This is not diversification as it is usually treated in the economics of the firm. The benefits if any, to the individual farmer in such a case would depend on the crop selected.

38/ Earl O. Heady, Economics of Agricultural Production and Resource Use, Prentice Hall, 1952, pp. 231-234, 510-522; Max F. Millikan and David Hapgood, No Easy Harvest; The Dilemma of Agriculture in Underdeveloped Countries, Little, Brown and Co., 1967, p. 24.

39/ Brown, op. cit. (1963), p. 27; Samper, op. cit., p. 110; and Fraser, op. cit., p. 23.

> even distribution over the year, a diversified cropping pattern is strongly recommended for these basically monocropped Eastern states with food crops interspersed with cash crops (jute or tea), fodder crops, and vegetables near the relatively high-income-urban-industrial centres.40/

Many of the crops that would be raised under a diversification program can be, as Mitchell and Schatan have pointed out, produced just as economically on family sized farm units as they can on larger units such as plantations.41/

b. Government Level

In addition to advantages at the farm level, diversification may lead to a number of supply-related benefits which will be particularly noted by government planners (though not necessarily by farmers).

First, diversification may reduce the need for governments to become involved in complex and troublesome supply control and/or price support programs. International supply control programs, as we have noted, exist for several export crops. Price supports may become increasingly needed for grains. Many of the commodities which would be produced as part of diversification are not normally covered by such governmental programs. (In the United States, for instance, there are no Federal supply control or price support programs for any fruits or vegetables except in a few instances where growers have voted for Federal marketing orders on several specialty crops.)

A second and perhaps more pressing reason favoring diversification is import substitution. Foreign exchange is in very short supply in the less developed nations -- especially those which do not have a specialized export commodity. Rather than spend this limited exchange on food imports, it is a tempting idea to produce at least some of them locally. For example:

> El Salvador is trying to boost its food production to slow down food imports -- last year they reached $30 million, up from $17 million in 1960. Principal imports were corn, dairy products, fruit, vegetables and wheat, all of which -- except wheat -- can be grown locally.42/

40/ Proceedings of the Symposium on Cropping Patterns (January 27-31, 1968), Indian Council of Agricultural Research, New Delhi, p. 48.

41/ Clyde Mitchell and Jacob Schatan, "The Outlook for Agricultural Development in Latin America," in Agricultural Development in Latin America: The Next Decade, Inter-American Development Bank, Washington, April 1967, p. 55.

42/ Welton, op. cit., p. 5.

While there are many cases where substitution could be the wise course of action, there are also exceptions. If the production of import-substituting crops in turn leads to a reduction in production of export crops, exchange will be saved only if the greater comparative advantage lies with the import-displacing crop.43/ If the import-displacing production does not lead to a reduction in export production, then the argument for diversification is more clear cut--though decision makers must still face the question of how to balance the allocation of scarce production resources. While the range of possibilities for import substitution is apt to be limited, the matter is likely to be of growing importance because the financing of food imports is a problem "... whose severity seems certain to increase..."44/

A third advantage of diversification, which has been alluded to earlier, is that it may make more efficient use of existing resources -- land, labor, and capital. Brown, after a study of Thailand, concluded that if diversification

> ... occurs as a result of more efficient use of the existing stock of resources, it may represent impressive gains in both the level of economic activity and the expansion of export earnings.45/

2. Demand

The major advantage of diversification may well be obvious by now: it can lead to the production of commodities which are, or are likely to be, in strong or increasing consumer demand.

a. Domestic Demand

A good indication of changes which may be expected in domestic demand can be gleaned from Table 1 (p. 13). As incomes grow, preferences in general turn to products with higher income elasticities of demand. This is reflected in the prices consumers are willing to pay.

As the Asian Agricultural Survey indicates:

> It is evident that as national incomes increase there will be an ever growing need for non-

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43/ Mellor, op. cit., p. 103. Actually the matter isn't quite this simple because the "shadow" or "real" cost of foreign exchange in countries like Pakistan may be twice as high as the official exchange rate. Then, too, costs of distribution have to be considered.

44/ FAO Commodity Review, 1967, p. 28. For a detailed discussion of the relationship between economic growth and imports, see Arthur B. Mackie, Foreign Economic Growth and Market Potentials for U.S. Agricultural Products, U.S. Department of Agriculture, Foreign Agricultural Economic Report No. 24, April 1965, 76 pp.

45/ Brown, op. cit. (1963), p. 31.

> cereal foods to fill consumer desires for more varied diets.
>
> Consumer demand, responsive to higher incomes, will shift purchases from grains to meat, animal products, fruits, and vegetables.46/

An FAO study indicates that in the less developed nations, demand was projected to grow most rapidly for livestock products, fats and oils, and sugar.47/

Empirical evidence on current changes in preferences is at hand. Spanish consumers are increasingly demanding products such as meat, milk, cheese, and eggs which are in short supply.48/ Another report indicates that "The Brazilian consumer would like more wheat, potatoes, beef, milk, and oranges and would substitute these for rice, corn, yuca, bananas, and edible oils."49/ Similarly, "Increased livestock output is a high-priority aim of the Government of Chile where consumer demand has resulted in costly imports of beef and slaughter animals."50/

As production and consumption of these crops expand, there may be a corresponding increase in the need to improve marketing facilities. Horticultural and livestock products generally require refrigeration and quick and careful handling. Practices which will do for grains may not be at all adequate for some of the products of diversification. We shall say more on this later.

b. Export Demand

Diversification can lead to new export possibilities. A shift from a monoculture crop in world surplus to one with a more favorable export climate could provide a way to expand and stabilize foreign exchange earnings. This happened when Thailand diversified its rice production.51/ New export markets could in turn, accelerate diversification. Van Roy notes that in Thailand "... the stimulus for the surge in non-rice agriculture -- particularly in 'upland' crops such as maize, jute, kenaf, and tapioca -- was not the pressure of population, but the incentive of higher prices afforded

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46/ Op. cit., Vol. I, pp. 72, 114.

47/ Agricultural Commodities, op. cit., p. 14.

48/ "Large Agricultural Outturn...," op. cit., p. 12.

49/ John E. Hutchison, "Preview: Brazil's Agricultural Trade," Foreign Agriculture, April 22, 1968, p. 5.

50/ Waldo S. Rowan, "U. S. Herefords Arrive at Chilean Ranches," Foreign Agriculture, June 3, 1968, pp. 12-13.

51/ Brown, op. cit. (1963), p. 16.

by new foreign markets."52/

Selling on international markets, however, can be a difficult process for a less developed nation -- especially if the competition is composed of the products of developed nations. The main problems may center around quality, packaging, and price. It may be, however, that other less developed nations would provide good, and less exacting, markets. In terms of export demand in the developed nations, the picture is not entirely clear, but an FAO report indicates that demand is most likely to rise for meat and coarse grains (for feeding livestock).53/ Livestock may prove to be an increasingly important outlet for grains.

3. Nutrition

Diversification of production can lead to significant improvements in domestic nutrition -- both quantitatively and qualitatively.

From a quantitative point of view, diversification programs involving multiple cropping could bring about significant increases in total food production. This point has not been lost on the International Rice Research Institute, where a major research effort in multiple cropping is underway. The purpose is to develop cropping systems that will produce the maximum amount of food per acre per year. Many of the crops involved (corn, grain sorghums, sweet potatoes, soybeans, vegetables, etc.) could be used for animal feed.54/

From a qualitative point of view, the variety of food crops included in a diversification program could lead to a significant improvement in the pattern of available nutrients. Fruits and vegetables are important sources of vitamins; pulses, livestock, and livestock products are leading sources of protein and fats. Johnson has recently stated that:

> Multiple cropping, which can produce a greater variety of foods with improved supply and quantity of protein, vitamins, minerals, offers the greatest hope of breaking the monotony of eating habits and improving the low quality of the diet in the rural villages of India.55/

52/ Edward Van Roy, "The Malthusian Squeeze on Thailand's Rice Economy," Asian Survey, July 1967 (as reprinted in Development Digest, April 1968, p. 35).

53/ Agricultural Commodities, op. cit., p. 15. At the same time most developing countries are making efforts to expand livestock production.

54/ "Notes on the International Rice Research Institute," enclosure to Department of State Airgram A-1696 from USON, New York, May 15, 1968; Orville L. Freeman, address to the Second World Conference on Animal Production, University of Maryland, July 15, 1968.

55/ Johnson (A. A.), op. cit., p. 10.

The greatest benefit will accrue when diversification represents added production, but even relatively small shifts in present production patterns could result in significant improvements.56/

4. Relation to Growth Goals

Where diversification takes the form of multiple cropping and/or leads to increased export sales, there is a clear contribution to economic development in the form of increased product and/or expanded export earnings.

In other situations the contributions may be less clear. For instance, in some cases diversification may mean a shift from export crops to food crops for domestic consumption. How compatible is this with growth goals? Tolley and Gwyer suggest that:

> ...technical progress needs to be concentrated in domestically consumed goods if the gains from the progress are to be kept at home instead of accruing to developed-country consumers.57/

A recent conference at Cambridge discussed this matter and also expressed a positive opinion:

> It was felt by many that too much effort has gone in to the development of export products, too little into food production for home consumption. We must increase the latter, not merely as a means of import substitution, but also as a means of developing the internal economy.58/

Both remarks may overstate the point, but they do suggest that a certain shift from export to domestic crops may be consistent with growth goals.

In other cases, diversification will mean a purely domestic shift from basic to other crops. As we have seen, these other crops have a higher elasticity of demand. If there is in fact a demand for them, it means that income levels are rising -- reflecting economic growth. Thus the shift is less a causal factor than an indicator of progress.

56/ Abercrombie, op. cit., p. 7. Nutritional factors are a major factor in the diversification effort envisaged by Ritchie for East Pakistan (see fn. 21, p. 6).

57/ Tolley and Gwyer op. cit., p. 432.

58/ Department of State Airgram from London, May 3, 1968 ("Report on the Cambridge Conference on Rural Development," March 24-April 3, 1968).

IV. CONSTRAINTS ON DIVERSIFYING FROM MONOCULTURE

While the diversification of monoculture has many advantages, there are also serious constraints on the process. The constraints influence both the nature and extent of diversification. They are perhaps most clearly seen if viewed in terms of the (a) benefits of monoculture, and (b) the limitations of diversification.

A. Advantages of Monoculture

Although the disadvantages of monoculture were discussed at length in the previous section, it should not be presumed that the practice is without its advantages. Some of these are more in the nature of passive or inherited advantages rather than positive or dynamic virtues.

1. Maintenance of Status Quo

In many, if not most, instances the simplest thing to do from the government's point of view would be to maintain the status quo -- or rather to merely attempt to improve existing cropping patterns and practices. As Johnson has put it: "... it is easier to raise yields on present crops under a monoculture system than to press forward with more complex multiple cropping systems."1/

In addition, the intensification of monoculture can often make good economic sense. Increasing the productivity of existing farming patterns is less likely to require sharp changes than is true of diversification -- existing techniques and facilities may do with relatively minor changes. Also, there may be economies of scale to be gained from increasing specialization or just enlarging present production units. The economic returns to these courses of action could be high in the short run.

This is especially true of plantation production of specialized export goods. Relatively substantial investments have been made in perennial plantings, packing or processing facilities, development of market outlets, research, etc. In terms of diversification, these are fixed liabilities which cannot, and should not, be easily disregarded.

2. Existence of Comparative Advantage

A strong economic argument can be made for retaining monoculture if it has a clear comparative advantage -- considering both production and marketing -- over alternative crops. This is true on both the domestic and international levels, subject to trade barriers of various types (which we will not discuss here).

Some nations which have considered or attempted diversification out of their major export commodity have found that the financial gap between it and the next best alternative is too wide. This was recently suggested in an article about Argentina: "... however energetically the country tries to

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1/ Johnson (A. A.), op. cit., p. 5.

diversify its industries, meat remains what it produces best and most cheaply, and it is moreover, meat of the very highest quality."2/ Similarly, in the Gold Coast long-term efforts at diversification out of cocoa have failed because returns to labor and capital in other crops were "...simply not commensurate with those available in cocoa."3/

In other instances, it has been decided to increase the production of crops in or nearing world surplus because the nation was felt to have a comparative advantage in cost and/or quality. A recent example is Kenya which has decided to expand tea production:

> The Kenyan Government feels considerable scope exists for increasing both domestic consumption and export of tea even though the world may overproduce tea in the next few years. Kenya's tea is of high quality, and its price has remained stable during the 1960's in spite of generally lower prices on the world market.4/

When, therefore, a nation or region has a comparative advantage in a monoculture crop, and where this is likely to continue, monoculture may well be the best path. The key problem is in determining what the future is likely to hold -- for as we have noted, such crops are subject to displacement by the emergence of other more efficient producers.

3. Exports as Source of Taxes and Foreign Exchange

Monoculture crops raised for export are important sources of taxes and foreign exchange in many countries. This does not mean that more diversified crops could not also be equally good sources, but export levels would have to be maintained and/or institutional arrangements might well have to be modified.

a. Tax Income

Export taxes are a widely used source of governmental revenue in many less developed countries. According to FAO, "All the major tropical agricultural products... as well as some subtropical products are subject to some form of export taxation in the principal exporting countries."5/

2/ "Till the Cows Come Home," op. cit., pp. 67-69.

3/ R. H. Green and S. H. Hymer, "Cocoa in the Gold Coast: A Study in the Relations between the African Farmers and Agricultural Experts," The Journal of Economic History, September 1966, p. 316.

4/ Howard A. Ackers, "Kenya Emphasizes Smallholder Tea Schemes," Foreign Agriculture, February 5, 1968, p. 8. Also, "Kenya Tea, Roads Get Extra Push," Foreign Agriculture, July 15, 1968, p. 8.

5/ John M. Clark, "Export Taxes on Tropical Products," Monthly Bulletin of Agricultural Economics and Statistics, May 1963, p. 10.

Such taxes represent a substantial source of government income. Export duties on rice in Thailand, for instance, amount to about 35% of f.o.b. value and represent roughly 10% of total government revenues.6/ In Zanzibar, export duties on cloves yield half of government income. In many countries these "taxes" as well as other income are obtained through marketing boards: receipts from such boards reportedly make up more than one quarter of government revenues in Ghana, Burma and Thailand.7/

Export taxation provides an easy source of income. It is low-cost and administratively simple. Generally only a relatively few products are involved. It provides a way of taxing smallholders which would not be possible otherwise. At the same time it makes it possible to avoid the regressive and politically unpopular course of taxing products used by low-income domestic consumers. Thus, export taxes often serve as a substitute for income taxes.8/

Still, there are several problems with export taxation. It can be pushed so far that it has disincentive effects on agricultural production.9/ But of more immediate concern is the fact that revenues tend to rise and fall with the level of exports. Though the tax rate could be increased as levels fall, this would in effect raise what may already be a heavy tax on the producer. Export taxes are seldom used in developed nations.10/

b. Foreign Exchange

Exports of agricultural products are a leading source of foreign exchange for nearly all of the less developed nations.

The degree of dependence on agriculture is higher than may be generally recognized. In 1965, out of 67 less developed nations, agricultural exports represented over 75% of the value derived from all exports in 37 countries.11/

6/ Van Roy, op. cit., p. 33.

7/ Tolley and Gwyer, op. cit., p. 433; Myint, op. cit., p. 52 (fn. 1) Marketing boards are often criticized because of the taxation aspect, but the fact is that much the same rate can be levied whether or not a board is involved -- as is the case for rubber in Ceylon and Malaysia, tea in Ceylon and India, and coffee in Guatemala (J. C. Abbott and H. Creupelandt, "Agricultural Marketing Boards in the Developing Countries: Problems of Efficiency Appraisal," Monthly Bulletin of Agricultural Economics and Statistics, September 1967, pp. 7-8).

8/ Clark, op. cit., p. 10; Abbott and Creupelandt, op. cit., p. 8.

9/ Glenn L. Johnson as cited in Carl K. Eicher, "The Dynamics of Long-Term Agricultural Development in Nigeria," Journal of Farm Economics, December 1967, p. 1162.

10/ Van Roy, op. cit., p. 33; Mellor, op. cit., p. 106; Clark, op. cit.,p.10.

11/ Compiled from data in Trade Yearbook, 1966, FAO, 1967, Table 124,

Nineteen of the nations secured over 90% of their exchange earnings from agriculture (Table 2).12/

As might be expected from our review of monoculture, a relatively small number of commodities account for a significant share of the agricultural total. Of the 20 countries where agriculture represented the highest proportion of total exports in 1965, one commodity group (and often, in turn, one commodity) accounted for an average of 56% of the agricultural total (Table 2).13/ The range was from a low of 26% to a high of 92% (sugar in Mauritius).

In view of the extreme shortage of foreign exchange in most less developed nations, any changes in agriculture which might influence exports need to be studied very carefully. As was pointed out earlier, diversification need not necessarily mean a reduction in export earnings -- it could even mean an increase. But in any case the process would need to be handled carefully.

B. Limitations on Diversification

As desirable as diversification may be in some regions or countries, there are clearly limits on how much should and can be done, and how quickly. We shall consider some of the major supply and demand restraints.

1. Supply

Moving from monoculture into diversified makes life more complicated for nearly everyone involved in the production process -- from farmer to planning official.

a. Technical and Economic Feasibility

One of the first jobs in carrying out diversification is to determine the economic technical feasibility of alternative crops or cropping patterns to those now under monoculture. This analysis can be a complex process if it is to be well done. Systems of mixed (crop-livestock) farming, are particularly difficult to work out. The existence of a narrow range of ecologi-

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pp. 357-418. Details on inter-regional trade for 19 leading commodities are contained in a recent five volume series of reports by Arthur B. Mackie under the general title of World Trade in Selected Agricultural Commodities, 1951-65, U. S. Department of Agriculture, Foreign Agricultural Economic Reports No. 42-46, June 1968.

12/ For the top 20 countries (Table 2) agricultural imports represented 26% of all imports. (See fn. 2, in Table 2 for listing of items included in "agriculture.")

13/ For the same countries, the leading food commodity groups represented an average of only 8.6% of all imports. This suggests that the range for import substitution in terms of raising a few key crops is limited at best.

Table 2 . RELATION OF AGRICULTURAL EXPORTS TO TOTAL EXPORTS: LESS DEVELOPED NATIONS, 1965

(in terms of value)

Country 1/	Agr. as Prop. of all Exports 2/	Leading Agricultural Commodity Group 3/	Group as Prop. of all Exports
Cambodia	99.4%	Cereals & preparations 5/	57.7%
Ethiopia 4/	98.9	Coffee, tea, cocoa, spices 6/	62.1
Malawi 4/	98.8	Tobacco	36.6
Sudan	98.0	Textile fibers 7/	46.2
Ceylon	97.2	Coffee, tea, cocoa, spices 8/	64.1
Gambia	97.1	Oilseeds & fixed vegetable oils	82.5
Senegal	97.0	Oilseeds & fixed vegetable oils	70.8
Somalia 4/	96.4	Fruit & vegetables 9/	43.8
Mali	96.2	Live animals	33.1
Viet Nam	95.8	Natural rubber	73.2
Ecuador 4/	95.4	Fruit & vegetables 9/	50.7
Togo	94.8	Coffee, tea, cocoa, spices	45.8
Mauritius	94.7	Sugar	92.1
Ivory Coast	93.6	Coffee, tea, cocoa, spices 6/	56.0
Argentina	93.6	Cereals & preparations 10/	39.0
Turkey	92.7	Textile fibers 7/	25.7
Madagascar	92.0	Coffee, tea, cocoa, spices 6/	47.2
Chad	91.5	Textile fibers 7/	77.6
Burma	90.2	Cereals & preparations 5/	69.6
Costa Rica	88.6	Coffee, tea, cocoa, spices 6/	44.0

Notes:

1/ Excludes minor nations.

2/ "Agriculture" includes wood and lumber, manufactured fertilizers and insecticides, and agricultural machinery.

3/ The items included in the general commodity groups are listed in detail in Appendix 1 of the source, pp. 449-457. Only the general commodity breakdowns are reported for each country. Oilseeds and fixed vegetable oils have been combined.

4/ 1964.

5/ Mainly rice.

6/ Mainly coffee.

7/ Mainly cotton.

8/ Mainly tea.

9/ Mainly bananas.

10/ Mainly wheat.

Source: Compiled from data in Trade Yearbook, 1966, FAO, 1967, Table 124, pp. 357-418.

cal zones will limit alternatives. And it may be that the alternatives to perennial crops which are grown on certain types of soils or rough terrain are limited. In Africa, for instance, it has been held that "... the places where cocoa grows best are not the places where food can be grown to best advantage."14/ Alternative crops have to be both technically and economically feasible if they are to be adopted by farmes and be commercially acceptable.

b. Labor

Once preliminary feasibility has been determined other matters come to the fore. One concerns labor. Beyond variations in seasonal utilization of farm family labor, diversification may require more, or less, labor overall. Either way there is a problem. When more labor is needed, individuals must be hired (which may not be difficult because of a general rural labor surplus), trained, and managed. When less labor is needed, there is a problem of unemployment or underemployment.15/ The latter is a particularly troublesome problem in the case of coffee diversification programs:

> For example in certain areas of Kenya where maize is the next-most-profitable alternative to coffee, the latter requires four times more labor per acre than maize.16/

There is a similar but even more severe problem in moving from sugar cane to cattle raising in northeast Brazil.17/

c. Physical Inputs

New cropping patterns are likely to require either additional or new inputs -- water, fertilizer, insecticides and pesticides, agricultural machinery, etc. These inputs have to be within reach of individual farmers at a reasonable price and the right time. Since the inputs will cost money, and further production risk may be involved, additional credit will be necessary. As Johnson notes, "... Indian credit is generally inadequate for single cropping let alone the added needs of multiple cropping, mixed farming, etc."18/ This could be provided either through the suppliers or through the suppliers or through other lending agencies. In some cases it may be desirable to subsidize the cost of inputs -- such as through the provision of irrigation programs, or the subsidy of farm chemicals.

14/ Wickizer, op. cit. (1960), p. 60.

15/ Mitchell and Schatan, op. cit., p. 58.

16/ Clayton, op. cit., p. 62.

17/ Reuss, op. cit. (see fn. 11, p. 4), p. 11.

18/ Johnson, (A. A.), op. cit., p. 6.

d. Research and Education

One of the most serious problems will be the lack of an adequate research base for the crops or livestock to be included in diversification. Both known and prospective alternatives will need to be studied. Much of the research in less developed nations in the past has concerned specialized export crops; domestic food crops have tended to be ignored. Eicher, for instance, recently noted the long history of research on export crops in Africa but went on to report for Nigeria that:

> ... virtually token efforts have been devoted to research on domestic food crops; there are no available research findings for any food crop which will increase yields by as much as 25%.19/

The Asian Agricultural Survey also found a similar gap in domestic research: "There is only a limited knowledge and understanding of proper animal and horticultural production practices under tropical conditions." The Survey noted that the development of an effective research program on large animals is a particularly time-consuming process.20/

The Reuss study of Latin America indicated that while there is interest in raising new crops, "We simply do not know what crops will grow or what additional inputs are needed to perfect the soil for the production of such crops." Promising alternatives exist for sugar cane, for instance, but study is needed on adaptation of varieties to soil conditions.21/

Research on horticultural crops and livestock is, however, beginning to receive increased attention. An Asian Vegetable Development Center, which would be located in Taiwan, is now under consideration.22/ Recently the Rockefeller and Ford Foundations have announced establishment of an International Center for Tropical Agriculture in Colombia and an Institute for Tropical Agriculture in Nigeria; both will include work on a variety of crops and livestock.23/ But much more than research is needed. As know-

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19/ Eicher, op. cit., p. 1167 (emphasis is Eicher's).

20/ Op. cit., Vol. I, pp. 72, 114. On livestock also see The World Food Problem, Vol. I, pp. 90-93.

21/ Reuss, op. cit., pp. 10, 11.

22/ Department of State Airgram A-787 from Taipei (and enclosures), July 26, 1968.

23/ "Foundations Boost Worldwide Agricultural Research," Foreign Agriculture, May 6, 1968, p. 4. (The Rockefeller Foundation has for many years sponsored research on vegetables and livestock in Latin America: see E. C. Stakman, et al., Campaigns Against Hunger, Harvard University Press, 1967).

ledge accumulates, an educational program of sizeable proportion will have to be carried out.

e. Social Factors

Another category of restraints, for lack of a more precise general term, might be called social. We shall note three.

First, many farmers in less developed nations are hesitant to adopt new crops or practices. They live close to the margin and are hesitant to take risks. Often prior experience has played a role: in Malaya for example, "Post-war experience with new introduction of crops on a fairly large scale and their subsequent lack of success (e.g. cocoa) has bred caution."[24] Farmers will innovate, however, if there is a clear demonstration of low risk or sharply higher returns -- as has been shown by the rapid adoption of new rice and wheat varieties.[25]

A second social restraint on diversification -- and one which one might not anticipate -- is that certain crops may have more social status than others. For instance,

> ... rice is the prestige crop in much of India both for production and consumption. A change-over to the coarser grains, jowar, bajra, maize and other crops will, in many cases, be resisted because of custom and prestige.[26]

A third limiting social factor may be the land tenure system. One report has indicated that monoculture has tended to persist in Latin America because of, among other things, the prevailing land tenure system.[27]

There will, of course, be other restraints of a social nature which may limit diversification efforts in any given area.[28]

24/ "Focus on Agricultural Diversification," op. cit., p. 10.

25/ I have calculated elsewhere that the acreage planted to the new high yielding wheat and rice varieties expanded as follows in Asia (excluding Taiwan and Ceylon): 1964/65, 200; 1965/66, 34,000; 1966/67, 2,200,000; and 1967/68, 17,100,000 ("Use of New Varieties of Wheat and Rice in the Less Developed Nations," USDA, IADS, July 1968, 11 pp.).

26/ Johnson, (A. A.), op. cit., p. 9.

27/ Mitchell and Schatan, op. cit., pp. 48, 52. Also see Clark, op. cit., p. 172.

28/ See, for example: Ester Boserup, The Conditions of Agricultural Growth, Aldine, 1965, p. 85 (cited in Miracle op. cit., p. 306, fn. 14); and McLoughlin, op. cit., p. 16.

2. Demand

Aside from supply considerations, the other main constraint on diversification program centers about demand. There is little sense in carrying out a diversification program if market demand -- either domestic or export -- for the product is not sufficiently strong enough to result in a favorable price to producers.

Diversification can involve basically two different types of products: (1) those which are quite similar in terms of income elasticities to those now produced -- such as moving from one type of grain to another; or (2) those which are quite different and have a noticeably higher income elasticity of demand -- such as moving from grain to horticultural products.[29/] In the first case, the existence of demand may not be especially dependent on a growth in income but may hinge on other factors such as relative price, habits and customs, further uses, etc. In the second case, the question of growth in incomes becomes much more important.

What has happened to income levels in recent years? Comprehensive data on individual incomes as such are not readily available, but surrogate data on changes in per capita gross national product are summarized in Table 3. It will be noted that the rate of increase in the developed nations, which are already at a high income level, was 3.8% per year. By contrast, the average in the less developed nations was 2.3% -- about 3/5 the rate in the developed nations. Among the less developed total, the rate was highest (3.9% or higher) in Spain and Puerto Rico and the Near East, and lowest (less than 1.6%) in Latin America, South Asia, and Africa. Within the regions, there were sharp variations: in Latin America the range was from -1.9% in the Dominican Republic to +4.8% in Panama.

If these rates continue, it is clear that the expansion in demand for the higher elasticity products of a diversified agriculture will on the average grow more slowly in the developing than in the developed nations. As the

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29/ The relationship induced by moving from food to feed grains is a bit more complicated. Part of the difficulty is in defining the two categories. In most of the less developed world only about 5% of total grain production is used for feed. Coarse grains are used to a much greater extent for food than is true in the U.S. (where they are classified as feed grains). Since coarse grains are not highly regarded for food purposes in the LDC's, they have a lower income elasticity than wheat and rice (see fn. 2, Table 1). But as (a) agricultural development takes place and supplies of wheat and rice expand to adequate and then surplus levels, and/or (b) economic growth occurs and the demand for livestock and in turn feed grains expands, the relationships between income elasticities may change. The result will likely be a relative increase in the elasticity for feed grains -- possibly to the point where it exceeds the elasticity for food grains. (Based on: Dana G. Dalrymple, "Domestic Utilization of Grain Supplies in the Less Developed Nations," USDA, IADS, September 1967, 11 pp.; Agricultural Commodities, op. cit., pp. 108-111; and discussion with Malcolm Clough, Feed Section, ERS, USDA.)

Table 3. ESTIMATED AVERAGE ANNUAL GROWTH IN GROSS NATIONAL PRODUCT PER CAPITA, 1960-1966

	Number of Countries	Increase in GNP Per Capita
Developed Nations		
United States	1	3.4%
Europe	18	3.5
Other Developed Countries	5	5.6
Total or Average	24	3.8%
Less Developed Nations		
Latin America	18	1.6%
Near East	6	3.9
South Asia	3	1.4
East Asia	7	2.3
Africa	11	1.1
Other	*	6.4
Total or Average	47	2.3%

Note:

* Largely Spain and Puerto Rico.

Source:

Gross National Product, Growth Rates and Trend Data, Agency for International Development, Office of Program Coordination, March 1967, p. 1.

rate has varied sharply among less developed nations, the rate of growth of demand for high-elasticity products will obviously be greater in some countries than others.

Demand can also be strongly influenced by government policy. Some nations have adopted a low domestic consumer price policy. In other cases, heavy duties and taxes (or non-price regulations) are levied on exports or imports. Such actions can well reduce the potential for diversification.

3. Marketing Facilities

Even if potential supplies and consumer demand exist, all will come to naught unless the marketing system is able to function effectively.

To the degree that diversification is associated with products of high income elasticity of demand, it may also be associated with products of quite a different character than the present marketing system is adequately prepared to handle. Livestock and horticultural products are generally quite perishable and therefore demanding in terms of their need for refrigeration, processing, quick transportation, etc. This means that if these products are to be effectively distributed, substantial investments may have to be made in marketing facilities. In some cases, entirely new marketing channels will have to be established. All of this may mean that in some cases diversification will have to await substantial improvements in infrastructure -- particularly transportation -- or will have to take a different form than was originally conceived.30/

Even where diversification does not involve quite different or perishable products, it needs to be preceded by adjustments or improvements in present marketing systems. Eicher reports, for instance, that the development of an extensive railroad and road network, along with a vast range of ecological zones, enabled Nigeria to develop a diversified agriculture at an early date.31/

30/ For instance, in East Pakistan transportation facilities are so limited that few horticultural crops other than a less perishable item like potatoes could be effectively raised and marketed in distant markets in any quantity (Dalrymple and Akeley, op. cit., pp. 15-16, 36-37).

31/ Eicher, op. cit., pp. 1164-1165. Also see Myint, op. cit., pp. 41-42. The general importance of transportation in the development process is reviewed by Colin Clark and Margaret Haswell in The Economics of Subsistence Agriculture, MacMillan, London, 1964, pp. 157-173 (chp. ix).

Since the marketing systems in most less developed countries are quite rudimentary, improvements are to be welcomed.32/ But substantial costs may be involved, and these need to be taken into consideration when planning diversification programs. Furthermore, existing governmental policies may not encourage private domestic of foreign investment.

32/ This is particularly true in view of the shift of population from rural to urban areas during development. The result is a shift away from home produced food to purchases at retail. Unless the marketing system is improved apace, the result may be inflationary pressures on food prices. (Robert D. Stevens, Elasticity of Food Consumption Associated With Changes in Income in Developing Nations, U. S. Department of Agriculture, Foreign Agricultural Economic Report No. 23, March 1965, pp. iv, 27-31, 62-66.)

V. IMPLEMENTATION OF DIVERSIFICATION PROGRAMS

By now the reader may have the growing suspicion that it is easier to talk about diversification than it is to do something about it. Implementation is indeed a key problem. It is also a very difficult one -- and is shaped to a large degree by the specific situation in the specific country. Accordingly, we will offer only a few general remarks.

A. General Strategy

In considering the implementation of a diversification program at a national or regional level, there are a number of basic questions which need to be answered. They might be grouped as follows:

- What is the potential value of diversification for country X considering (a) domestic needs (including import substitution), and (b) export needs?

- What commodities and what producing regions could and/or should be involved? Should domestic or export markets be given priority?

- Would scarce resources be better utilized in carrying out diversification of expanding yields of crops currently in production? Is diversification worthwhile?

- How far and how fast should diversification be pushed?

The basic economic problem is one of optimum resource allocation -- of equalizing net marginal returns among alternative forms of investment such as intensification and diversification.1/ In this case the issue may be how far one moves from monoculture toward diversification. This question will not be easily resolved. It will require, in fact, a great deal of research on a country-by-country, case-by-case basis. There is no general answer.2/

It would seem evident, however, that some sort of balance is needed. Harry Johnson, for one, has expressed concern that too much policy emphasis may be placed on raising productivity in the food sector in the interest of

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1/ Alternatives may overstate the divergence because, as we have noted earlier, they form part of a continuum. The economics of diversification at the firm level are discussed by Heady, op. cit., pp. 231-234, 510-522.

2/ Millikan and Hapgood, op. cit., p. 24; Sidney S. Hoos, "Comment" in Southworth and Johnston op. cit., pp. 449-450.

self-sufficiency at the expense of traditional export sectors. He cites three reasons: (1) the choice should depend on alternative opportunity costs in the individual nation, (2) the foreign exchange attainable by expansion of traditional exports may be worth more than the resources involved could earn by being employed in import substitution, and (3) there may be a neglect of the opportunities for mutually profitable trade among the LDC's as development continues.3/

In any case, the financing of diversification programs can be a problem of the first magnitude. The key problem is that monoculture exports are needed to pay for diversification programs: diversification programs which reduce exports may in turn be hindering further diversification efforts.4/ The answer, if time allowed, would be to invest the proceeds of exports to develop a base for a more efficient and diversified agriculture. As Mellor puts it:

> The foreign exchange proceeds should be used to protect and build the efficiency of that industry through a highly developed infrastructure which in turn will provide new economies in a diversity of additional industries.5/

Time may not permit this approach. Other methods of financing will be discussed in the last section of this chapter.

B. Role of Government

Governments clearly play a central role in initiating and giving force to diversification programs. This is carried out at both the national and international levels.

1. National Level

National governments are responsible for the infrastructure and the policies necessary for diversification. Infrastructure takes the form of roads, large-scale irrigation projects, research and education, etc. Policies relate to both the government's actual involvement in diversification and its encouragement of private investment. The government itself can elect to establish: subsidies for certain inputs necessary for diversification, appropriate price policies for agriculture, export duty concessions, etc.

3/ Harry G. Johnson, "Comment," in Scuthworth and Johnston, op. cit., p. 452.

4/ Gerda Blau and D. A. Music, Agricultural Commodity Trade and Development - Prospects, Problems and Policies, FAO Commodity Policy Series 17, Special Studies Program No. 2, 1964, p. 11.

5/ Mellor, op. cit., p. 110.

With respect to the private sector, the government can do a great deal to encourage private and foreign investment.

The need for a partnership between government and private enterprise is most important if diversification is to become a reality. This is because the production and marketing of some diversified crops is apt to be quite complicated compared to the monoculture of, say, a grain crop. Where reliance has been placed on socialized agriculture throughout the world, diversification appears to have lagged. This is due to a number of production and marketing factors, not among the least of which is the socialist predilection for a centrally controlled, large scale, and mechanized agriculture.

Soviet agriculture provides a good example. Over the years, the Soviets have emphasized food grain production on state and collective farms. Livestock and horticultural production have lagged, despite strong consumer interest in improved diets. A large share of total production of these two commodity groups is raised by peasants on small private plots. In 1960, the proportions provided by the private sector were as follows for livestock meat and lard 48%, milk 48%, eggs 79%. The breakdown for horticultural crops in 1962 was: fruit 45%, vegetables 42%, and potatoes 70%. Quality is generally low and off-season supplies limited. Substantial attempts have been, and are being, made to expand the state sector. But insufficient resources have been allocated. The state marketing system remains in especially poor condition.6/

On the other hand, where both government and private enterprise have made a joint effort in some of the less developed nations, considerable progress has been made.7/ In Taiwan and South Korea, for instance, where small, owner-operated farms dominate:

> The growing and processing of specialty crops such as mushrooms, pineapples, apples, bananas, vegetables for the fresh market and the processor, etc. are already important sources of rural income and export earnings in these two countries.8/

6/ The relationship between socialization and diversification has not been directly covered in the literature. The highly simplified remarks presented here should be considered more as hypotheses than conclusions. They are based on articles I have done on other aspects of Soviet agriculture, particularly the fruit and vegetable industry. A general study of the private sector has recently been provided by Karl-Eugen Wadekin in "Private Production in Soviet Agriculture," Problems of Communism, January/February 1968, pp. 22-30.

7/ It is not my purpose in this paragraph to try to draw a close and comprehensive comparison with the Soviet Union (there would be real problems in doing this) but rather to highlight differences in the role of the private sector.

8/ Asian Agricultural Survey, op. cit., Vol. I, p. 7. Taiwan is now the

The production of swine, poultry and eggs has been encouraged in Taiwan, and during the period from 1950 to 1965 grew faster than crop production. Farmers' associations, cooperatives, and private enterprise play an important role in the marketing of all products.9/

Diversification of production into horticultural and livestock products is a difficult process and requires the best efforts of both government and private industry. It is the government's role to see that private enterprise is fully engaged.

2. International Level

Diversification of production of commodities which are prominent in international programs may well be necessary.

a. Commodity Agreements

Where a commodity such as coffee is in international surplus, efforts to cut back production must take place in not just one but many nations. Furthermore, individual coffee producing nations may be too poor to finance diversification themselves and will need financial assistance.

The importance of international diversification out of coffee was recognized in the draft International Coffee Agreement of 1962. The preamble stated "... close international cooperation on coffee marketing will stimulate the economic diversification and development of coffee-producing countries...." Chapter X set up an International Coffee Fund, one of whose purposes was cooperation in the financing of agricultural diversification in coffee-producing areas...."10/ The proposed fund met uneven support. In August 1967, the Economist reported:

> ... both Brazil and Colombia have strongly supported the setting up of a $300 million diversification fund financed by a dollar a bag levy on each producing country's exports. Brazil is even prepared to forgo its own right to use these funds. The Africans hesitate, fearing that Brazil and Colombia will use their voting strength to favor diversification pro-

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world's largest exporter of canned pineapple and mushrooms and second largest in canned asparagus (M. F. Perkins, "Taiwan: Development That Works," Finance and Development, September 1967, p. 170).

9/ Raymond P. Christensen, Taiwan's Agricultural Development: Its Relevance for Developing Countries Today, U. S. Department of Agriculture, Foreign Agricultural Economic Report No. 39, April 1968, pp. 19-20, 63-66.

10/ Wickizer, op. cit. (1964), p. 287.

jects put forward by their neighboring Central American producers.11/

Agreement on the details of a diversification fund was obtained, however, for the 1968 International Coffee Agreement (reprinted in Appendix, pp. 52-53). Members will pay $.60 per bag on yearly exports of over 100,000 bags, for a five year period (the rate can be raised to $1.00 per bag by a two thirds vote).12/ The United States has offered to lend the fund up to $15 million and to match contributions from other consumers up to an additional $15 million.13/

Further developments with respect to the Fund will have considerable impact on the future of internationally financed diversification efforts. Pincus states that "In embryo at least, it foreshadows a principle of international control of the proceeds of monopoly pricing in the interests of economic development."14/

b. Aid Programs

Bilateral and multilateral assistance programs sponsored by the developed nations can of course be of great direct help to developing nations undertaking diversification programs.15/ Both capital and technical assistance is provided bilaterally, for instance, by the Agency for International Development (under AID sponsorship, a U.S. Department of Agriculture team recently worked with the Central American Bank for Economic Integration to evaluate the feasibility of diversifying from coffee and cotton production into vegetable oilseeds16/). At the multilateral level, the World Bank and regional groups such as the Asian Development Bank are leading potential sources of capital for diversification efforts. The Food and Agriculture Organization does technical assistance work. The immediate prospects for help from such sources, however, may be dimmed by the financial difficulties faced by foreign aid programs in the United States and elsewhere.

11/ "London Bun Fight," op. cit. (see fn. 13, p. 4), p. 749.

12/ International Coffee Agreement, 1968, op. cit., pp. 27-28.

13/ "Third Annual Report on the International Coffee Agreement Transmitted to Congress," Department of State Bulletin, March 4, 1968, p. 338.

14/ Pincus, op. cit. (see fn. 21, p. 23).

15/ Indirect benefit can be provided by special trade relationships which we will not discuss here, except to note a two-way arrangement Japan has had with certain less developed nations such as Thailand -- from which it has been importing corn and more recently sorghums (see Donald Chrisler, Preferential Trade Arrangements of Foreign Countries, U. S. Department of Agriculture, Foreign Agricultural Economic Report No. 41, March 1968, p. 15).

16/ From information provided by Marshall Fox, International Agricultural Development Service, U.S. Department of Agriculture. A report is in press.

VI. CONCLUDING REMARKS

The diversification of commercial agricultural production at the national or regional level will be a matter of increasing importance in many less developed nations in the future. Powerful and widespread changes in the supply of and demand for agricultural products are adding new emphasis to the need for re-evaluation of present monoculture production and marketing practices. In such a context, diversification may well become a matter of growing concern to planners and administrators.

Diversification is a broad and complex subject. It has also been relatively neglected in development literature. In this introductory -- and essentially pragmatic -- report we have been concerned with some of the more important issues of national or regional importance. We have viewed diversification in terms of a move from commercial monoculture, recognizing that it is difficult to draw a sharp line between the two.

Diversification can take many forms. The specific pattern followed depends on a host of local economic and biological factors. In terms of commodities, both those used domestically and for export may be involved. A crop which is used as a base for monoculture in one area may be a source of diversification in others. But in most cases the products introduced represent a good with a higher income elasticity of demand.

Despite widespread lip service to diversification throughout the developing world, in general little has been accomplished. In many cases there is good reason for this: the nations are concentrating their limited resources on increasing domestic supplies of basic grains to at least minimal levels. In other countries there may have been myopia concerning export alternatives. But when and where grain targets are achieved, and surpluses of international export commodities build up, attention will swing to diversification.

Interest in the diversification of monoculture stems at once from the disadvantages of monoculture and the advantages of diversification. The general problems of monoculture are of a technical, economic, and political nature. Traditionally these problems have been viewed in terms of the special difficulties of export crops, but also are beginning to apply to production of grain for domestic use. Diversification avoids some of the difficulties of monoculture and in addition can have some distinct advantages in terms of supply, demand, nutrition, and influence on economic growth.

But there are, as might be expected, constraints -- sometimes powerful ones -- on the process of diversification. These relate to the advantages of monoculture and the limitations on diversification. Advantages center about the relative ease of maintaining the status quo, possible existence of comparative advantage, and use of monoculture exports as sources of taxes and foreign exchange. Diversification can be limited by complex production and marketing problems. Substantial investments may be required.

Clearly there can be no quick or easy judgement about diversification. Diversification of the sort discussed here is a complicated problem in

resource allocation. Much study is necessary before it can be determined whether diversification is advisable in a particular situation, what form and pace it should take, etc. Evaluation will have to be made very much on a case-by-case basis. There are no general answers.

Still, there is good reason to think that diversification will become increasingly feasible and desirable. The gradual -- and sometimes sudden -- attainment of traditional production goals, the increased availability of modern inputs, the growth of national incomes, the improvement of transportation, may tip the balance in favor of diversification efforts in a growing list of countries. Where it does, implementation will require the best efforts of both government and private enterprise on a national and international level.

To better guide these efforts, much more research is needed on diversification at the conceptual and applied levels. Development of a theoretical economic framework at the national level (to match that which exists at the firm level) could be of significant value in organizing future analyses. One possibly useful starting point is the theory of comparative advantage. The theory should be applied to both production and marketing, and should be modified to take into account many of the related economic, social, nutritional and biological factors discussed in this paper. Moreover, comparative advantage should by no means be considered in a static framework: it is constantly shifting. Case studies of past and present diversification programs could be most useful for both model building and for operational purposes.

In closing, it should be recognized that while this report has focused on the diversification of market-oriented monoculture, other potentially important forms of diversification exist. One could be the diversification of traditional subsistence production. Where monoculture exists at this level, other crops might be added which could make use of idle resources and provide the farmer more adequate nutrition. Such possibilities could well be worth further study.

Diversification broadly considered, therefore, can be many things. Any one of them could hold substantial promise under appropriate conditions. But in few, if any, cases will this promise be realized unless diversification efforts are preceded by careful study and planning.

VII. APPENDIX

International Coffee Agreement, 1968

Chapter XVI, Article 54

Diversification Fund

(1) There is hereby established the Diversification Fund of the International Coffee Organization to further the objectives of limiting the production of coffee in order to bring supply into reasonable balance with world demand. The Fund shall be governed by Statutes to be approved by the Council not later than 31 December 1968.

(2) Participation in the Fund shall be compulsory for each Contracting Party that is not an importing Member and has an export entitlement of over 100,000 bags. Voluntary participation in the Fund by Contracting Parties to which this provision does not apply, and contributions from other sources, shall be under such conditions as may be agreed between the Fund and the parties concerned.

(3) An exporting Participant liable to compulsory participation shall contribute to the Fund in quarterly instalments an amount equivalent to US$0.60 times the number of bags it actually exports in excess of 100,000 bags each coffee year to quota markets. Contributions shall be made for five consecutive years commencing with coffee year 1968-69. The Fund by a two-thirds majority vote may increase the rate of contribution to a level not exceeding US$1.00 per bag. The annual contribution of each exporting Participant shall be assessed initially on the basis of its export entitlement for the year of assessment as at 1 October. This initial assessment shall be revised on the basis of the actual quantity of coffee exported to quota markets by the Participant during the year of assessment and any necessary adjustment in contribution shall be effected during the ensuing coffee year. The first quarterly instalment of the annual contribution for coffee year 1968-69 becomes due on 1 January 1969 and shall be paid not later than 28 February 1969.

(4) The contribution of each exporting Participant shall be utilized for programmes or projects approved by the Fund carried out inside its territory, but in any case twenty percent of the contribution shall be payable in freely convertible currency for use in any programmes or projects approved by the Fund. In addition a percentage of the contribution within limits to be established in the Statutes shall be payable in free convertible currency for the administrative expenses of the Fund.

(5) The percentage of the contribution to be made in freely convertible currency in accordance with paragraph (4) may be increased by mutual agreement between the Fund and the exporting Participant concerned.

(6) At the commencement of the third year of operation of the Fund the Council shall review the results obtained in the first two years and may

then revise the provisions of this Article with a view to improving them.

(7) The Statutes of the Fund shall provide for:

(a) the suspension of contributions in relation to stipulated changes in the level of coffee prices;

(b) the payment to the Fund in freely convertible currency of any part of the contribution which has not been utilized by the Participant concerned;

(c) arrangements that would permit the delegation of appropriate functions and activities of the Fund to one or more international financial institutions.

(8) Unless the Council decides otherwise, an exporting Participant which fails to meet its obligations under this Article shall have its voting rights in the Council suspended and shall not enjoy any increase in its export entitlement. If the exporting Participant fails to meet the obligations for a continuous period of one year, it shall cease to be a Party to the Agreement ninety days thereafter, unless the Council decides otherwise.

(9) Decisions of the Council under this Article shall be taken by a distributed two-thirds majority vote.

Source: International Coffee Agreement, 1968, World Coffee Information Center, Washington, pp. 27-28.

VIII. SELECTED BIBLIOGRAPHY

(printed materials*)

A. Books

1. Authored

G. L. Carefoot and E. R. Sprott, Famine on the Wind: Man's Battle Against Plant Disease, Rand McNally, 1967.

P. P. Courtenay, Plantation Agriculture, Praeger, 1965.

Earl O. Heady, The Economics of Agricultural Production and Resource Use, Prentice Hall, 1952.

Jonathan V. Levin, The Export Economies; Their Pattern of Development in Historical Perspective, Harvard University Press, 1960.

Alasdir I. Macbean, Export Instability and Economic Development, Harvard University Press, 1966.

John Mellor, The Economics of Agricultural Development, Cornell University Press, 1966.

Hla Myint, The Economics of the Developing Countries, Praeger, 1965.

2. Edited

Raymond E. Borton, Case Studies to Accompany 'Getting Agriculture Moving', Agricultural Development Council, 1967.
- T. M. Fraser, Jr. "Introduction of Vegetable Growing."
- G. V. Samper, "The Promotion of Development and Crop Diversification in Predominantly Coffee Growing Areas."

M. J. Herskovits and M. Harwitz (eds.), Economic Transition in Africa, Northwestern University Press, 1964.
- Bruce F. Johnston, "Changes in Agricultural Productivity"

H. M. Southworth and B. F. Johnston (eds.), Agricultural Development and Economic Growth, Cornell University Press, 1967.
- Raj Krishna, "Agricultural Price Policy and Economic Development."
- G. S. Tolley and G. D. Gwyer, "International Trade in Agricultural Products in Relation to Economic Development."
- Sidney S. Hoos, "Comment" (on Tolley & Gwyer)
- Harry G. Johnson, "Comment" (on Tolley & Gwyer)

---

* Printed materials have been identified in text by underlining. References with title in quotes have been mineographed or similarly reproduced and are not listed here.

B. Reports

1. Public Agencies (excluding FAO)

Clyde Mitchell and Jacob Schatan, "The Outlook for Agricultural Development in Latin America," in Agricultural Development in Latin America: The Next Decade, Inter-American Development Bank, Washington, April 1967.

Henry S. Reuss, Food For Progress in Latin America, House of Representatives, Committee on Banking and Currency, Subcommittee on International Finance, February 8, 1967.

Asian Agricultural Survey, Asian Development Bank, Manila, March 1968, 2 vols.

2. Food and Agriculture Organization (FAO)*

a. Annual Publications

- The State of Food and Agriculture, 1965
  "Agriculture and Industrialization"

- FAO Commodity Review, 1967

b. Special Reports

- Agricultural Commodities - Projections for 1975 and 1985, 1967, 2 vols.

C. Bulletins

Raymond P. Christensen, Taiwan's Agricultural Development: Its Relevance for Developing Countries Today, U. S. Department of Agriculture, Foreign Agricultural Economic Report No. 39, April 1968.

Lester R. Brown, Agricultural Diversification and Economic Development in Thailand: A Case Study, U. S. Department of Agriculture, Foreign Agricultural Economic Report No. 8, March 1963.

Dana G. Dalrymple and Robert V. Akeley, The Potato Industry in East Pakistan: Improving Seed Potato Multiplication and Storage, U. S. Department of Agriculture, International Agricultural Development Service, May 1968.

Robert D. Stevens, Elasticity of Food Consumption Associated with Changes in Income in Developing Nations, U. S. Department of Agriculture, Foreign Agricultural Economic Report No. 23, March 1965.

---

* Excluding the Monthly Bulletin of Agricultural Economics and Statistics which will be referred to in Section D.

D. Articles

1. Author Listed

J. C. Abbott and H. Creupelandt, "Agricultural Marketing Boards, in the Developing Countries: Problems of Efficiency Appraisal," Monthly Bulletin of Agricultural Economics and Statistics, September 1967.

K. C. Abercrombie, "Subsistence Production and Economic Development," Monthly Bulletin of Agricultural Economics and Statistics, May 1965.

Lester R. Brown, "The Agricultural Revolution in Asia, "Foreign Affairs, July 1968.

John M. Clark, "Export Taxes on Tropical Products," The Monthly Bulletin of Agricultural Economics and Statistics, May 1963.

Carl K. Eicher, "The Dynamics of Long-Term Agricultural Development in Nigeria," Journal of Farm Economics, December 1967.

C. Davis Fogg, "Economic and Social Factors Affecting the Development of Small-holder Agriculture in Eastern Nigeria," Economic Development and Cultural Change, April 1965.

Marvin P. Miracle, "'Subsistence Agriculture:' Analytical Problems and Alternative Concepts," American Journal of Agricultural Economics, May 1968, pp. 292-310.

H. J. Mittendorf, "Marketing Aspects in Planning Agricultural Processing Enterprises in Developing Countries, " Monthly Bulletin of Agricultural Economics and Statistics, April 1968.

John C. Scholl, "Mexico's Grain Problem: A Production Boom That Won't Turn Off," Foreign Agriculture, July 3, 1967.

R. A. Smith and Richard Ogden, "Bananas in Colombia," Foreign Agriculture, December 1967.

V. D. Wickizer, "The Smallholder in Tropical Export Production" Food Research Institute Studies, February 1960 (Vol. I, No. 1).

2. No Author Listed

"Focus on Agricultural Diversification," The Malayan Agriculturist, 1964/65 (Vol. 5).

"Till the Cows Come Home," The Economist, May 11, 1968.